CEOS Value Chain



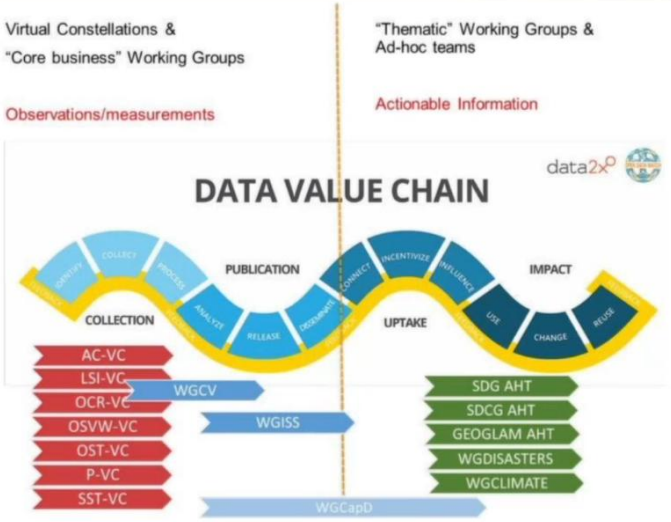
Committee on
Earth Observation Satellites

Robert Cheetham,
NASA SIT Chair Team

W1.1: Data Value Chain
SIT TW 2026
Washington DC, USA
8-10 September, 2026

CEOS Value Chain

- Strengthen internal organizational resilience
- Understand where new activities (biodiversity, wildfire, etc.) align
- Understand gaps and roles where commercial engagement could be increased or improved
- Realize and increase capture of downstream impact



Who did we talk to?

CEOS Internal

- 2026 Chair
- 2027 Chair
- SIT Chair
- Secretariat
- CEO
- SEO
- CEOS ARD OG
- WGISS
- WGDisasters
- WGCapD
- LSI-VC

CEOS Agencies

- ASI
- GA / CSIRO
- European Commission
- ESA
- EUMETSAT
- ISRO
- JAXA
- NASA
- NOSA
- NRCAN
- SANSA
- UK Space Agency

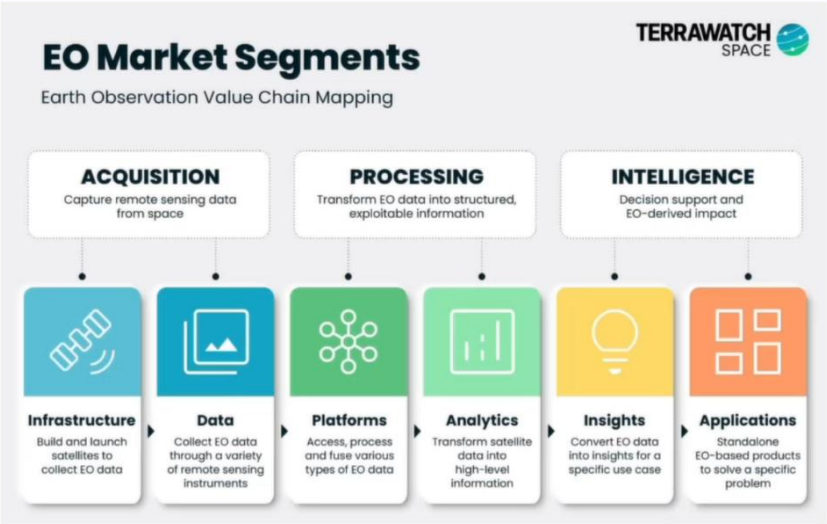
CEOS External

- AWS
- Cesium
- Clark University
- Climate Spark
- Common Space
- EarthDaily Analytics
- Esri
- GEO Secretariat
- LGND AI
- moreGeo
- OGC
- Pixxel
- Synspective
- Terrawatch
- Umbra
- WGIC

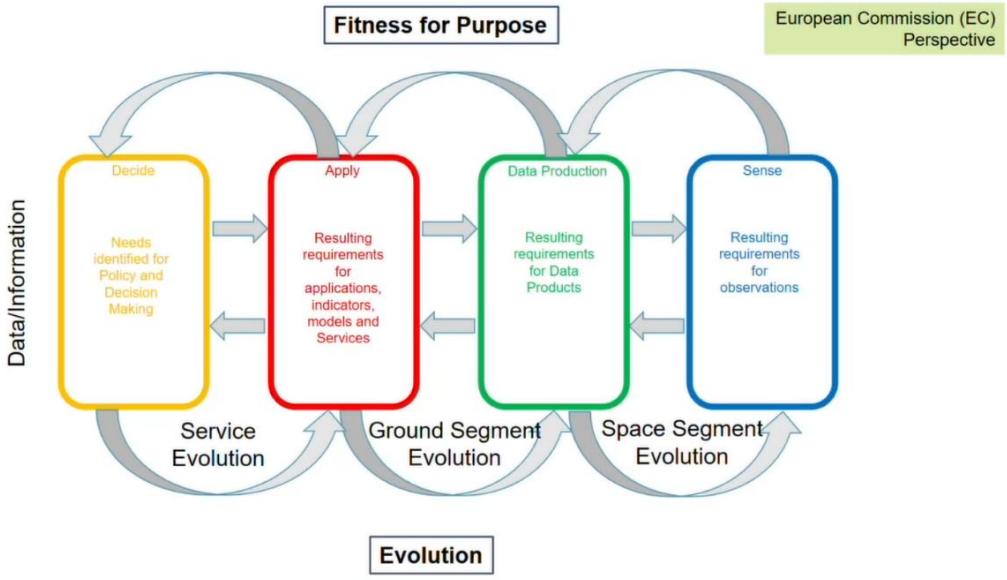
Value Chain Skepticism

- Context-dependent
  - Research vs. Operations
  - Science vs. Commercial
  - Data flow vs. Stakeholder priorities
- Multitude of partners and contributors can't be represented
- Multiple time scales
- Focus on data and information production but at the expense of long-term archival maintenance and other data collection modes

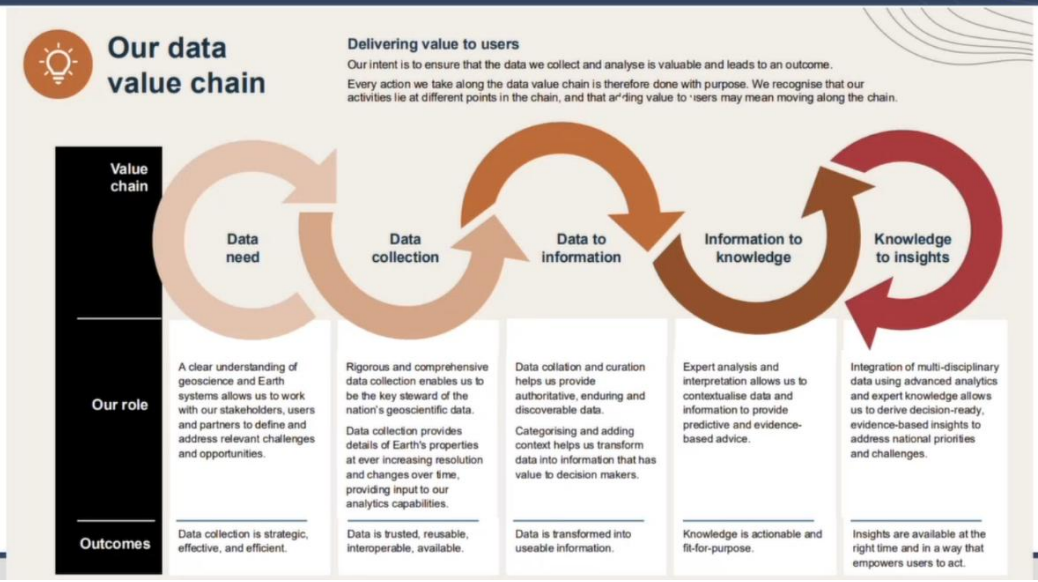
Terrawatch EO Value Chain



Value Chain: Targets & Indicators for Decision Making



Geoscience Australia



CEOS Roles with greatest impact

Pre-Acquisition

- Community needs assessment
- Outreach and support to emerging market agencies
- Coordinating multiple national agencies
- Visibility into coverage gaps
- MIM survey
- COVE

Upstream

- Cal/Val Portal
- Calibration Networks
  - RadCalNet
  - SARCalNet
  - HyperNet
  - TIRCalNet
- Virtual Constellations

CEOS Role - Intangibles

- Coordination and collaboration
- Relationship-building through dinner and corridor conversations
- Knowledge transfer and best practices
- GitHub org - glossary, etc.
- Lends authority to collaborative efforts - a CEOS recommendation is more trusted than a bilateral effort
- Cultivating trust

CEOS Roles with greatest impact

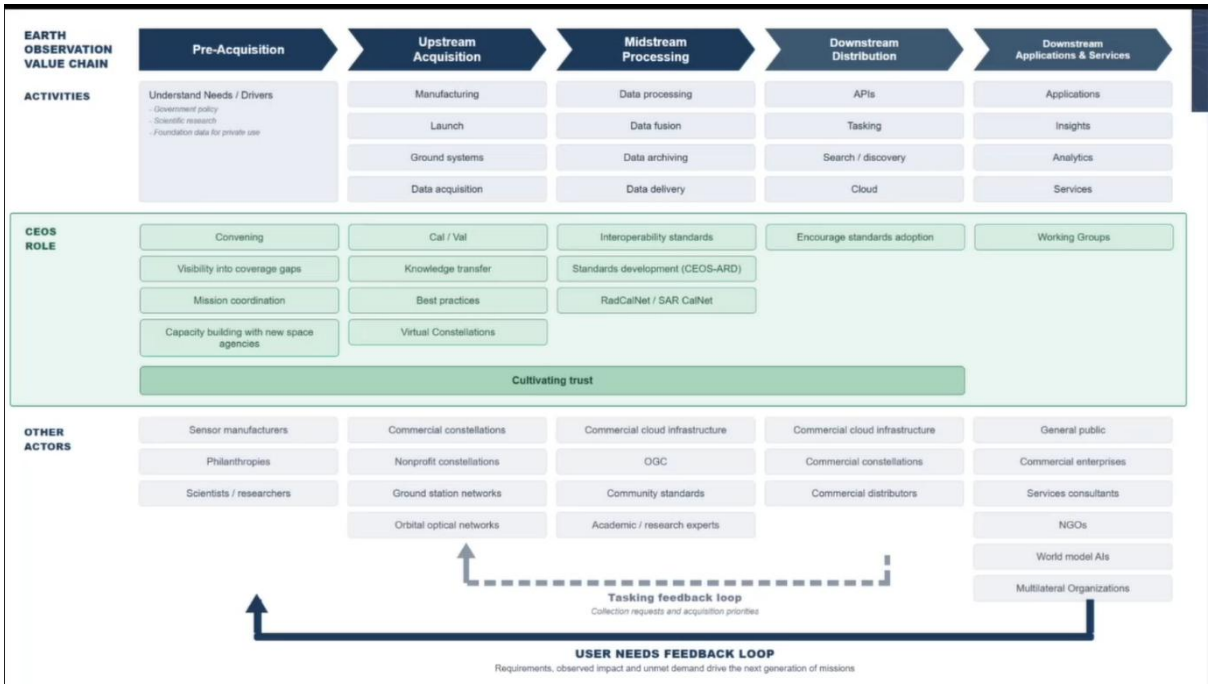
Midstream

- CEOS-ARD
- Promoting standards adoption by national agencies
- WGISS/OGC Common Metadata Model
- AVHRR data archive recovery efforts

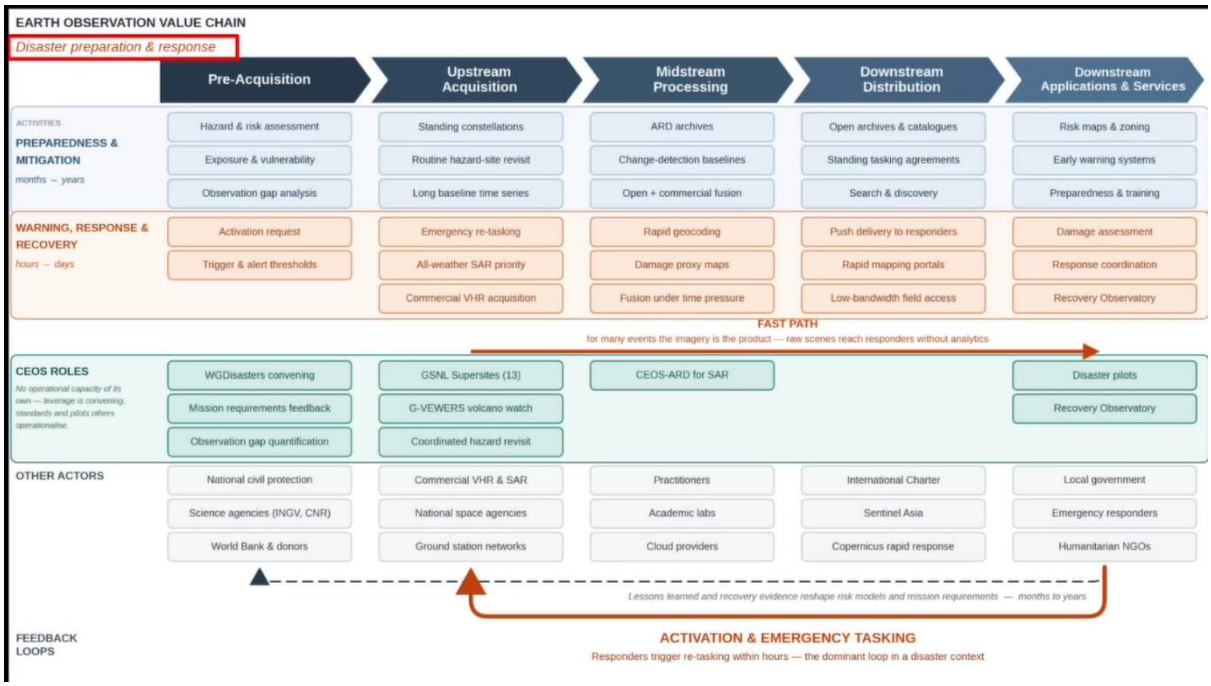
Downstream

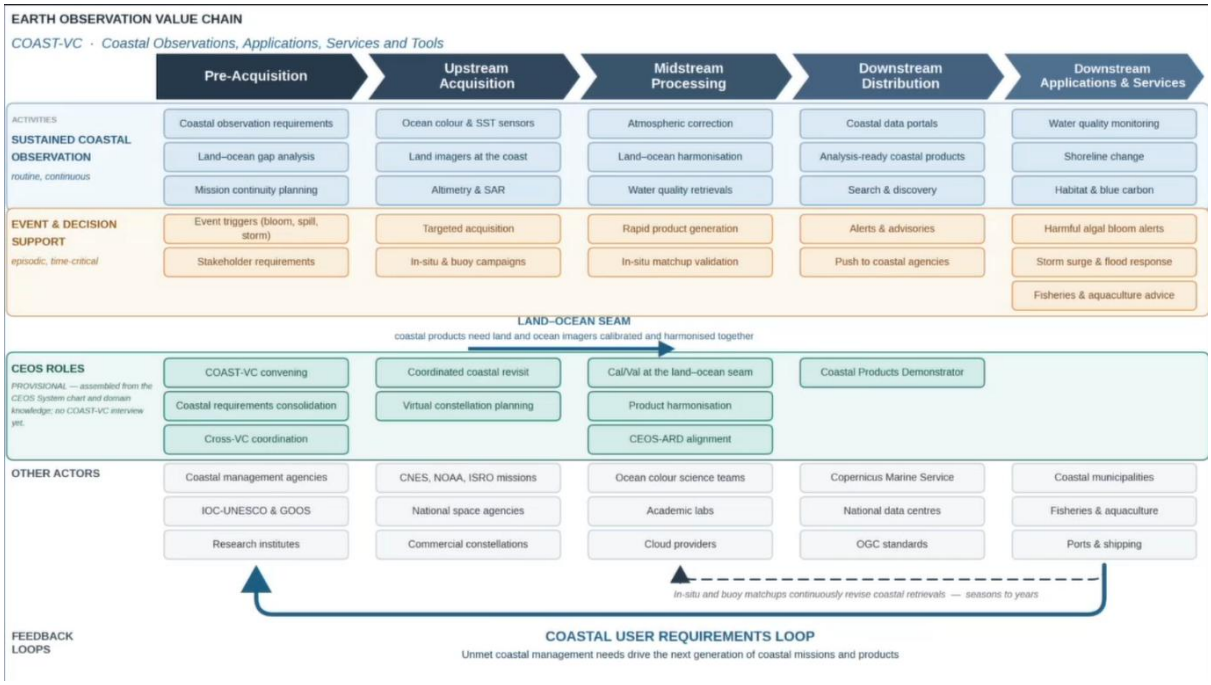
- Thematic Working Groups
- GSNL Supersites

1. Generic Linear Value Chain



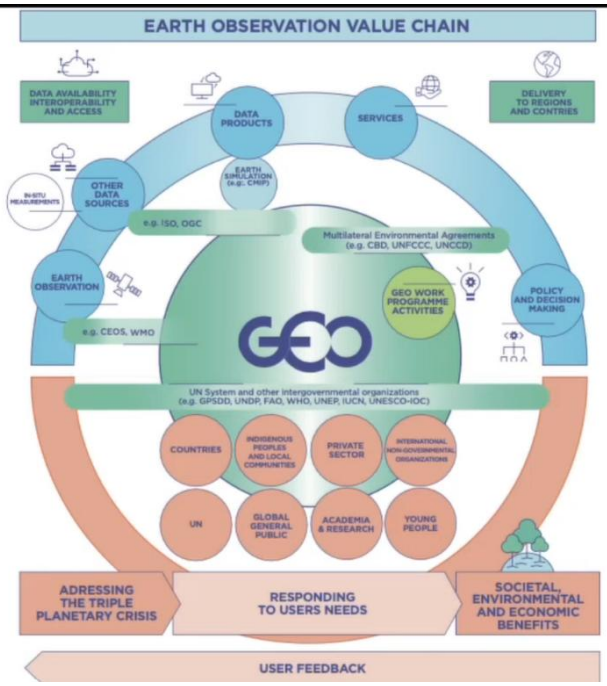
2. Context-specific Value Chain





3. EO Value Cycle

Circles



CEOS ROLES BY STAGE

- **PRE-ACQUISITION**
  - Building trust
  - Convening
  - Coverage gap visibility
  - Mission coordination and planning
  - Capacity building with new agencies
  - MIM Database
- **UPSTREAM / ACQUISITION**
  - Cal / Val
  - Knowledge transfer
  - Best practices
  - Virtual constellations
- **MIDSTREAM / PROCESSING**
  - Interoperability standards
  - CEOS-ARD
  - RadCalNet / SAR-CalNet
- **DOWNSTREAM / DISTRIBUTION**
  - Encourage standards adoption
- **DOWNSTREAM / APPLICATIONS**
  - Working Groups

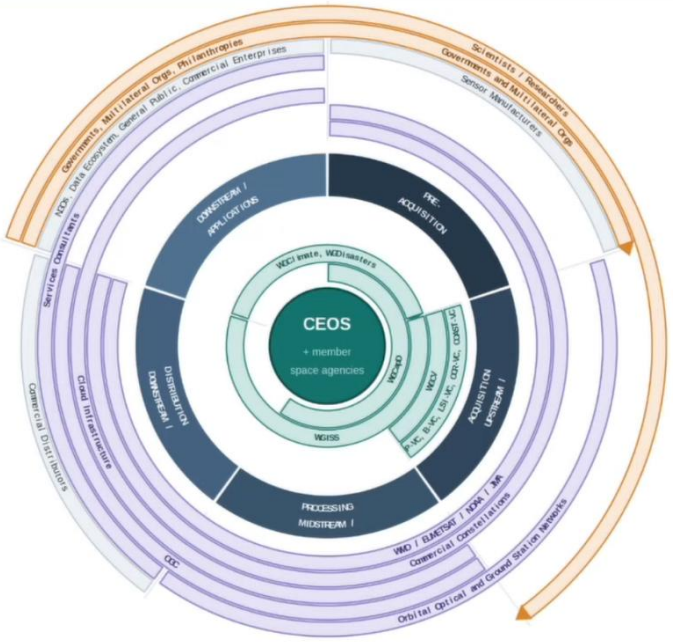
CEOS working group / VC

Spans several stages

Single stage only

Loops back to the start

arrowhead = re-enters at Pre-Acquisition



Helical

EARTH OBSERVATION VALUE CHAIN

As a helix, seen from above

CEOS AT EVERY TRANSITION

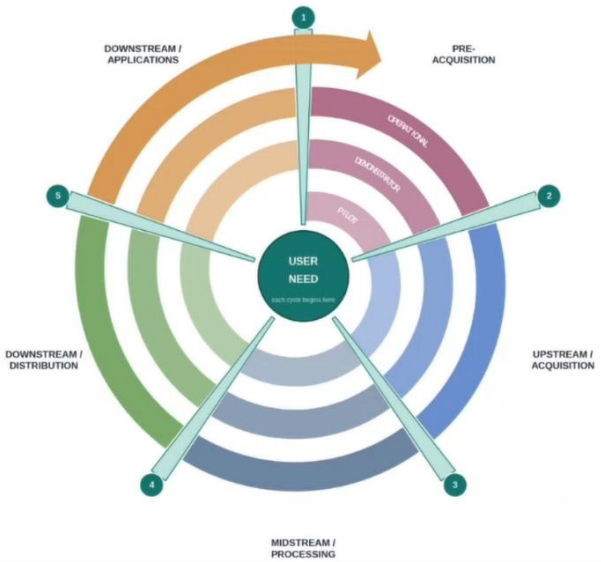
1. **Applications → Pre-Acquisition**
   Convening · coverage gap visibility
2. **Pre-Acquisition → Upstream**
   Mission coordination and planning
3. **Upstream → Midstream**
   Cal / Val · best practices
4. **Midstream → Distribution**
   CEOS-ARD · interoperability standards
5. **Distribution → Applications**
   Encourage standards adoption

Cultivate trust runs through all five.

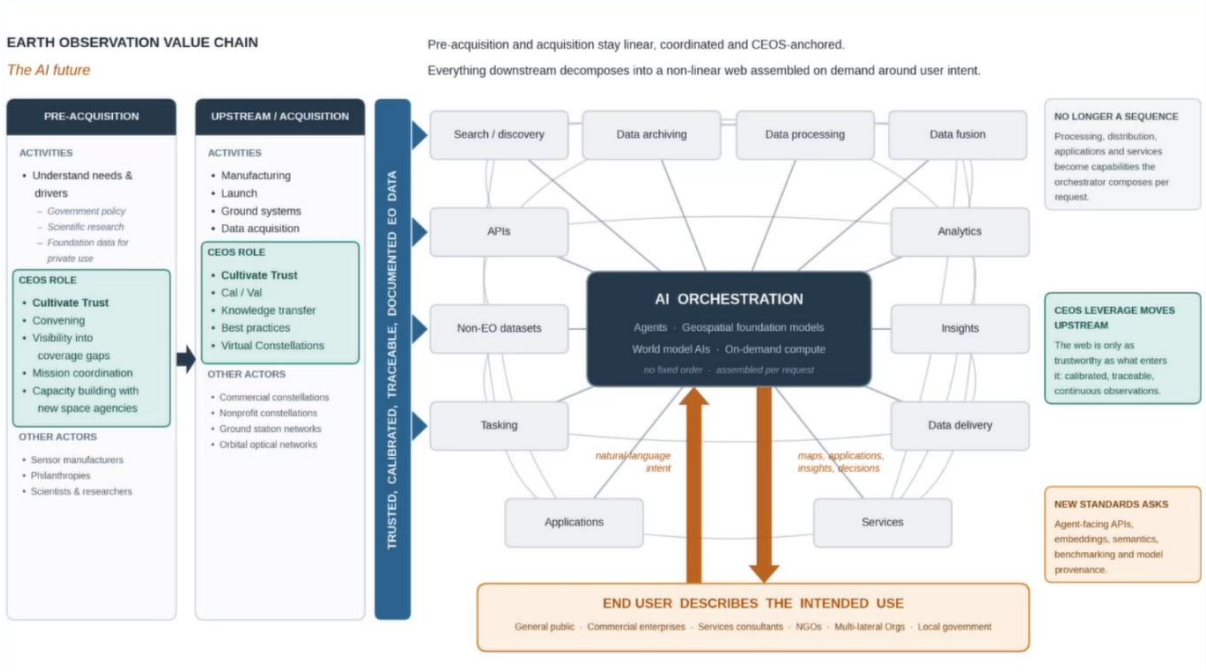
EACH LAP RAISES MATURITY

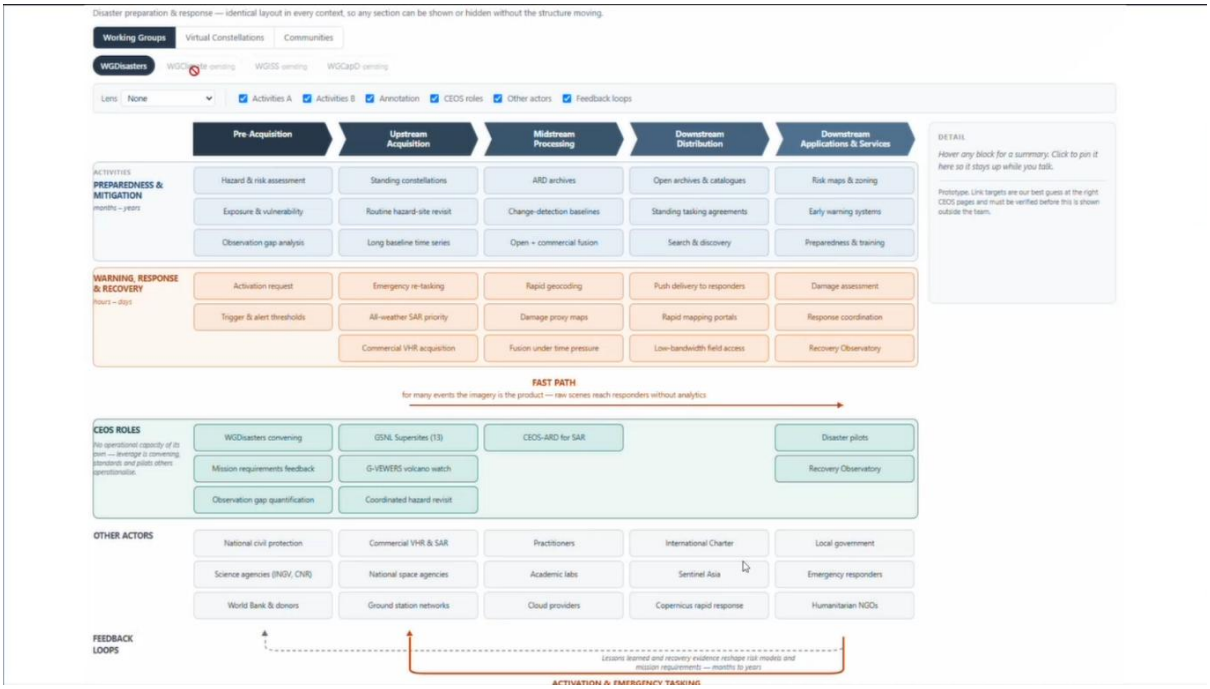
- Pilot
- Demonstrator
- Operational

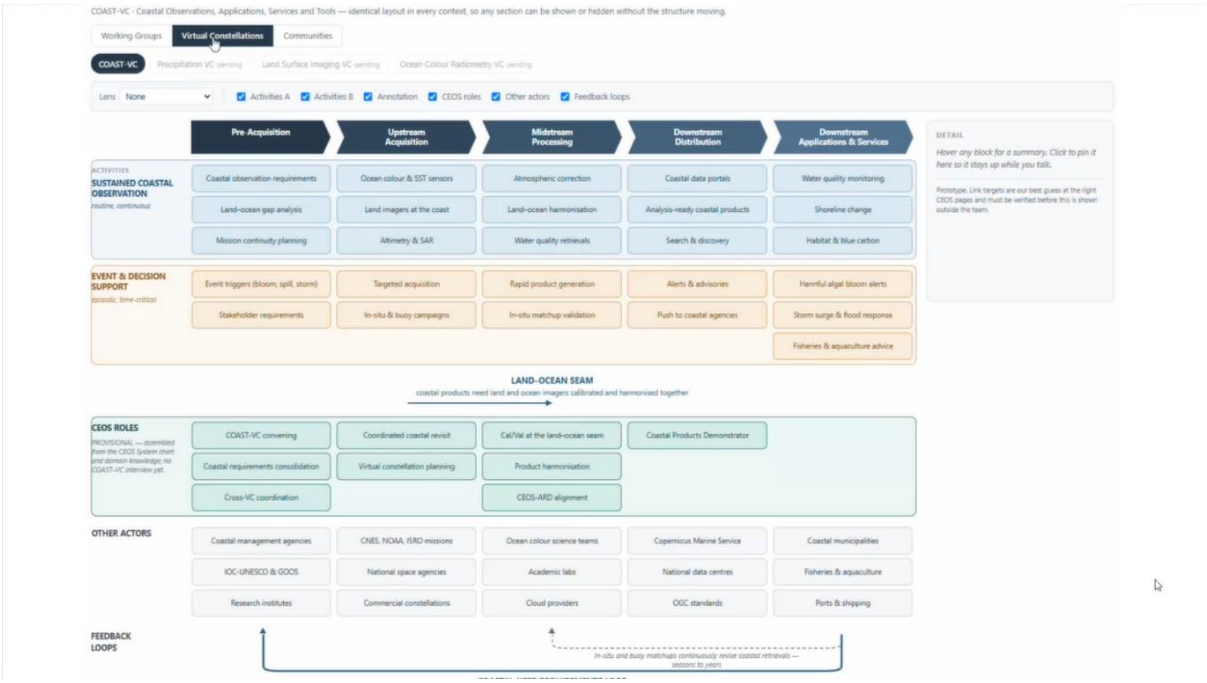
The chain never closes: each pass returns to the same questions with more capability behind them.

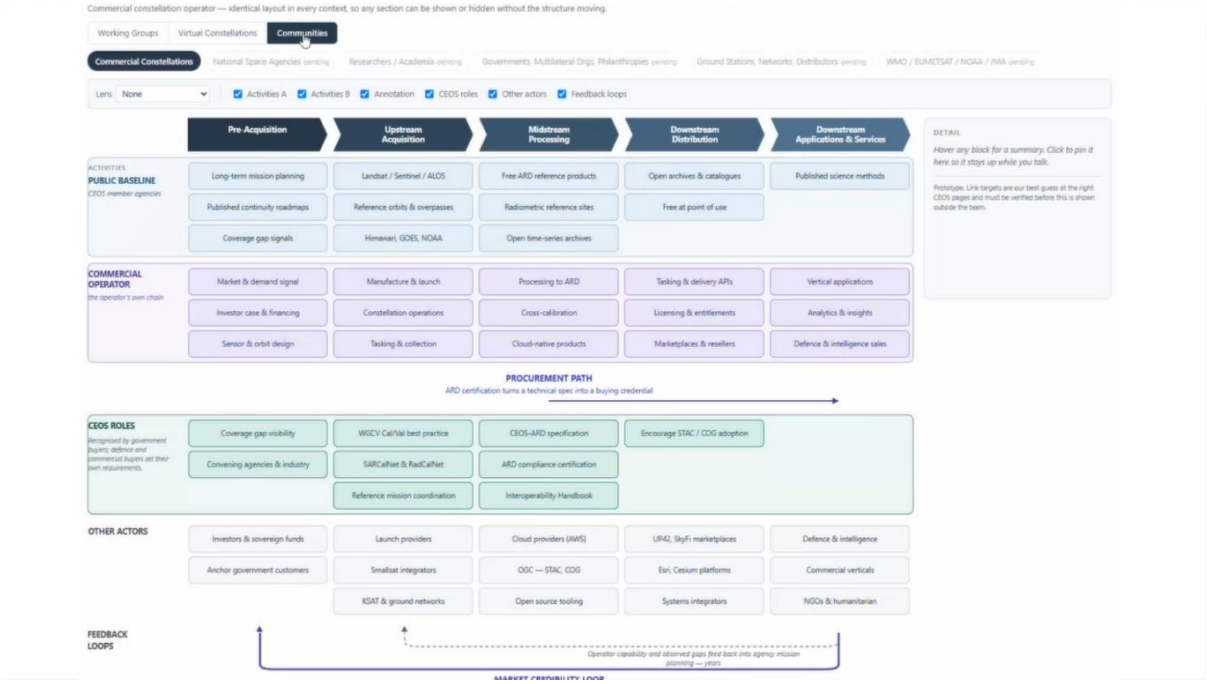


4. Future with AI Value Chain


EARTH OBSERVATION VALUE CHAIN
The AI future
Pre-acquisition and acquisition stay linear, coordinated and CEOS-anchored.
Everything downstream decomposes into a non-linear web assembled on demand around user intent.
PRE-ACQUISITION
ACTIVITIES
Understand needs & drivers
Government policy
Scientific research
Foundation data for private use
CEOS ROLE
Cultivate Trust
Convening
Visibility into coverage gaps
Mission coordination
Capacity building with new space agencies
OTHER ACTORS
Sensor manufacturers
Philanthropies
Scientists & researchers
UPSTREAM / ACQUISITION
ACTIVITIES
Manufacturing
Launch
Ground systems
Data acquisition
CEOS ROLE
Cultivate Trust
Cal / Val
Knowledge transfer
Best practices
Virtual Constellations
OTHER ACTORS
Commercial constellations
Nonprofit constellations
Ground station networks
Orbital optical networks
TRUSTED, CALIBRATED, TRACEABLE, DOCUMENTED EO DATA
Search / discovery
Data archiving
Data processing
Data fusion
APIs
Analytics
Non-EO datasets
Insights
Tasking
Data delivery
AI ORCHESTRATION
Agents · Geospatial foundation models
World model AIs · On-demand compute
no fixed order · assembled per request
natural-language intent
maps, applications, insights, decisions
Applications
Services
END USER DESCRIBES THE INTENDED USE
General public · Commercial enterprises · Services consultants · NGOs · Multi-lateral Orgs · Local government
NO LONGER A SEQUENCE
Processing, distribution, applications and services become capabilities the orchestrator composes per request.
CEOS LEVERAGE MOVES UPSTREAM
The web is only as trustworthy as what enters it: calibrated, traceable, continuous observations.
NEW STANDARDS ASKS
Agent-facing APIs, embeddings, semantics, benchmarking and model provenance.


Disaster preparation & response — identical layout in every context, so any section can be shown or hidden without the structure moving.
Working Groups
Virtual Constellations
Communities
WGDisasters
Lens
None
Activities A
Activities B
Annotation
CEOS roles
Other actors
Feedback loops
Pre-Acquisition
Upstream Acquisition
Midstream Processing
Downstream Distribution
Downstream Applications & Services
DETAIL
Hover any block for a summary. Click to pin it here so it stays up while you talk.
ACTIVITIES
PREPAREDNESS & MITIGATION
months – years
Hazard & risk assessment
Standing constellations
ARD archives
Open archives & catalogues
Risk maps & zoning
Exposure & vulnerability
Routine hazard-site revisit
Change-detection baselines
Standing tasking agreements
Early warning systems
Observation gap analysis
Long baseline time series
Open + commercial fusion
Search & discovery
Preparedness & training
WARNING, RESPONSE & RECOVERY
hours – days
Activation request
Emergency re-tasking
Rapid geocoding
Push delivery to responders
Damage assessment
Trigger & alert thresholds
All-weather SAR priority
Damage proxy maps
Rapid mapping portals
Response coordination
Commercial VHR acquisition
Fusion under time pressure
Low-bandwidth field access
Recovery Observatory
FAST PATH
for many events the imagery is the product — raw scenes reach responders without analytics
CEOS ROLES
WGDisasters convening
GSNL Supersites (13)
CEOS-ARD for SAR
Disaster pilots
Mission requirements feedback
G-VIEWERS volcano watch
Recovery Observatory
Observation gap quantification
Coordinated hazard revisit
OTHER ACTORS
National civil protection
Commercial VHR & SAR
Practitioners
International Charter
Local government
Science agencies (INGV, CNR)
National space agencies
Academic labs
Sentinel Asia
Emergency responders
World Bank & donors
Ground station networks
Cloud providers
Copernicus rapid response
Humanitarian NGOs
FEEDBACK LOOPS
Lessons learned and recovery evidence reshape risk models and mission requirements — months to years
ACTIVATION & EMERGENCY TASKING


COAST-VC - Coastal Observations, Applications, Services and Tools — identical layout in every context, so any section can be shown or hidden without the structure moving.
Working Groups
Virtual Constellations
Communities
COAST-VC
Precipitation VC pending
Land Surface Imaging VC pending
Ocean Colour Radiometry VC pending
Lens None
Activities A
Activities B
Annotation
CEOS roles
Other actors
Feedback loops
Pre-Acquisition
Upstream Acquisition
Midstream Processing
Downstream Distribution
Downstream Applications & Services
DETAIL
Hover any block for a summary. Click to pin it here so it stays up while you talk.
Prototype. Link targets are our best guess at the right CEOS pages and must be verified before this is shown outside the team.
ACTIVITIES
SUSTAINED COASTAL OBSERVATION
routine, continuous
Coastal observation requirements
Ocean colour & SST sensors
Atmospheric correction
Coastal data portals
Water quality monitoring
Land-ocean gap analysis
Land imagers at the coast
Land-ocean harmonisation
Analysis-ready coastal products
Shoreline change
Mission continuity planning
Altimetry & SAR
Water quality retrievals
Search & discovery
Habitat & blue carbon
EVENT & DECISION SUPPORT
episodic, time-critical
Event triggers (bloom, spill, storm)
Targeted acquisition
Rapid product generation
Alerts & advisories
Harmful algal bloom alerts
Stakeholder requirements
In-situ & buoy campaigns
In-situ matchup validation
Push to coastal agencies
Storm surge & flood response
Fisheries & aquaculture advice
LAND–OCEAN SEAM
coastal products need land and ocean imagers calibrated and harmonised together
CEOS ROLES
PROVISIONAL — assembled from the CEOS System chart and domain knowledge; no COAST-VC interview yet.
COAST-VC convening
Coordinated coastal revisit
Cal/Val at the land–ocean seam
Coastal Products Demonstrator
Coastal requirements consolidation
Virtual constellation planning
Product harmonisation
Cross-VC coordination
CEOS-ARD alignment
OTHER ACTORS
Coastal management agencies
CNES, NOAA, ISRO missions
Ocean colour science teams
Copernicus Marine Service
Coastal municipalities
IOC-UNESCO & GOOS
National space agencies
Academic labs
National data centres
Fisheries & aquaculture
Research institutes
Commercial constellations
Cloud providers
OGC standards
Ports & shipping
FEEDBACK LOOPS
In-situ and buoy matchups continuously revise coastal retrievals — seasons to years


Commercial constellation operator — identical layout in every context, so any section can be shown or hidden without the structure moving.
Working Groups
Virtual Constellations
Communities
Commercial Constellations
National Space Agencies pending
Researchers / Academia pending
Governments, Multilateral Orgs, Philanthropies pending
Ground Stations, Networks, Distributors pending
WMO / EUMETSAT / NOAA / JMA pending
Lens None
Activities A
Activities B
Annotation
CEOS roles
Other actors
Feedback loops
Pre-Acquisition
Upstream Acquisition
Midstream Processing
Downstream Distribution
Downstream Applications & Services
DETAIL
Hover any block for a summary. Click to pin it here so it stays up while you talk.
Prototype. Link targets are our best guess at the right CEOS pages and must be verified before this is shown outside the team.
ACTIVITIES
PUBLIC BASELINE
CEOS member agencies
Long-term mission planning
Landsat / Sentinel / ALOS
Free ARD reference products
Open archives & catalogues
Published science methods
Published continuity roadmaps
Reference orbits & overpasses
Radiometric reference sites
Free at point of use
Coverage gap signals
Himawari, GOES, NOAA
Open time-series archives
COMMERCIAL OPERATOR
the operator's own chain
Market & demand signal
Manufacture & launch
Processing to ARD
Tasking & delivery APIs
Vertical applications
Investor case & financing
Constellation operations
Cross-calibration
Licensing & entitlements
Analytics & insights
Sensor & orbit design
Tasking & collection
Cloud-native products
Marketplaces & resellers
Defence & intelligence sales
PROCUREMENT PATH
ARD certification turns a technical spec into a buying credential
CEOS ROLES
Recognised by government buyers; defence and commercial buyers set their own requirements.
Coverage gap visibility
WGCV Cal/Val best practice
CEOS-ARD specification
Encourage STAC / COG adoption
Convening agencies & industry
SARCalNet & RadCalNet
ARD compliance certification
Reference mission coordination
Interoperability Handbook
OTHER ACTORS
Investors & sovereign funds
Launch providers
Cloud providers (AWS)
UP42, SkyFi marketplaces
Defence & intelligence
Anchor government customers
Smallsat integrators
OGC — STAC, COG
Esri, Cesium platforms
Commercial verticals
KSAT & ground networks
Open source tooling
Systems integrators
NGOs & humanitarian
FEEDBACK LOOPS
Operator capability and observed gaps feed back into agency mission planning — years

CEOS Value Chain

- No longer accurate
- Emphasize impact
- Ecosystem has changed

