



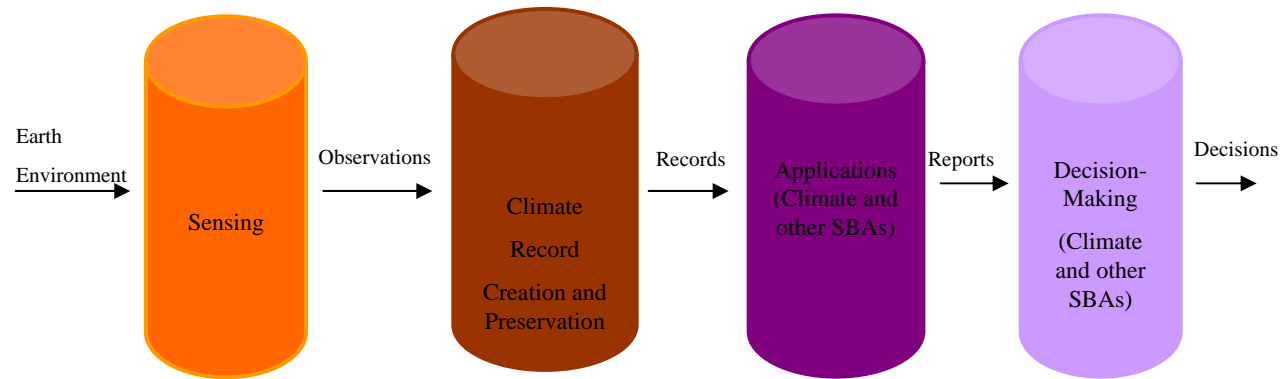
World Meteorological Organization

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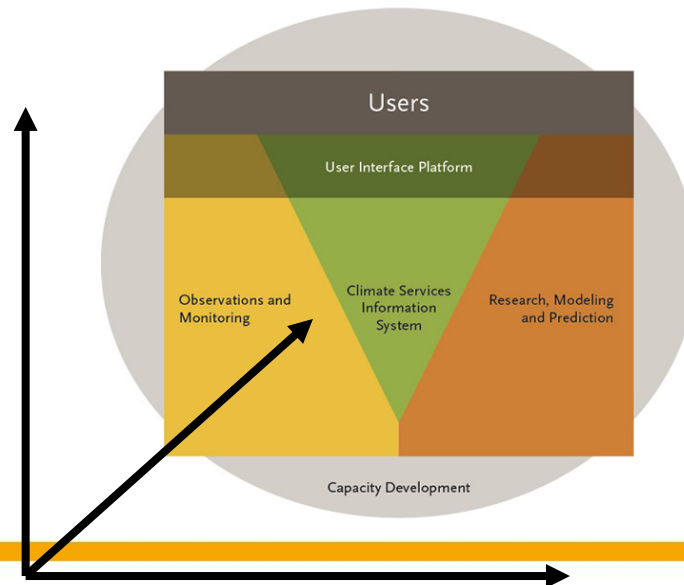
GFCS-Related Case Study for the Logical Architecture

Stephan Bojinski, WMO Space Programme

The “Logical View”



GFCS Schematic



Elements of climate services

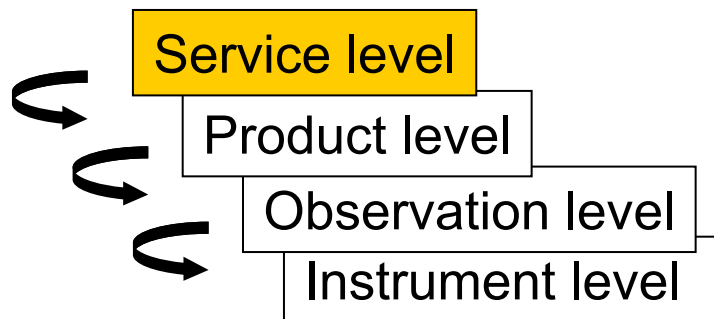
- GFCS: “A climate service is climate information prepared and delivered to meet user needs.”
- Core elements of a climate service are:
 - Monitoring
 - Reanalyses
 - Attribution of phenomena & events, including extremes
 - Indicators / indices
 - Forecasts (predictions and projections)
- Downstream elements of climate services could be:
 - Seasonal climate outlooks (3-6 months) over SE United States, to inform livestock and fruit farmers
 - Expected trend in annual rainfall over the next 3 decades in support of hydropower infrastructure decision-making in India
 - Has the recent drought in the Greater Horn of Africa (length/severity) been a 1 in 10, 1 in 30, 1 in 50 years event? (to inform building resilience against famine and manage risks)
 - How will sea-ice parameters change along the North-East passage over the next 20 years in September?



Service requirements in the areas of...

- Agriculture & Food Security, Water, Health, Disaster Risk Reduction (4 initial GFCS priority themes)

...need translation into product / observation / instrument requirements:



Level 4 ...
Level 2/3
Level 1/2
Level 0; Instr design
(CEOS-defined data processing levels)



Translation process ↩

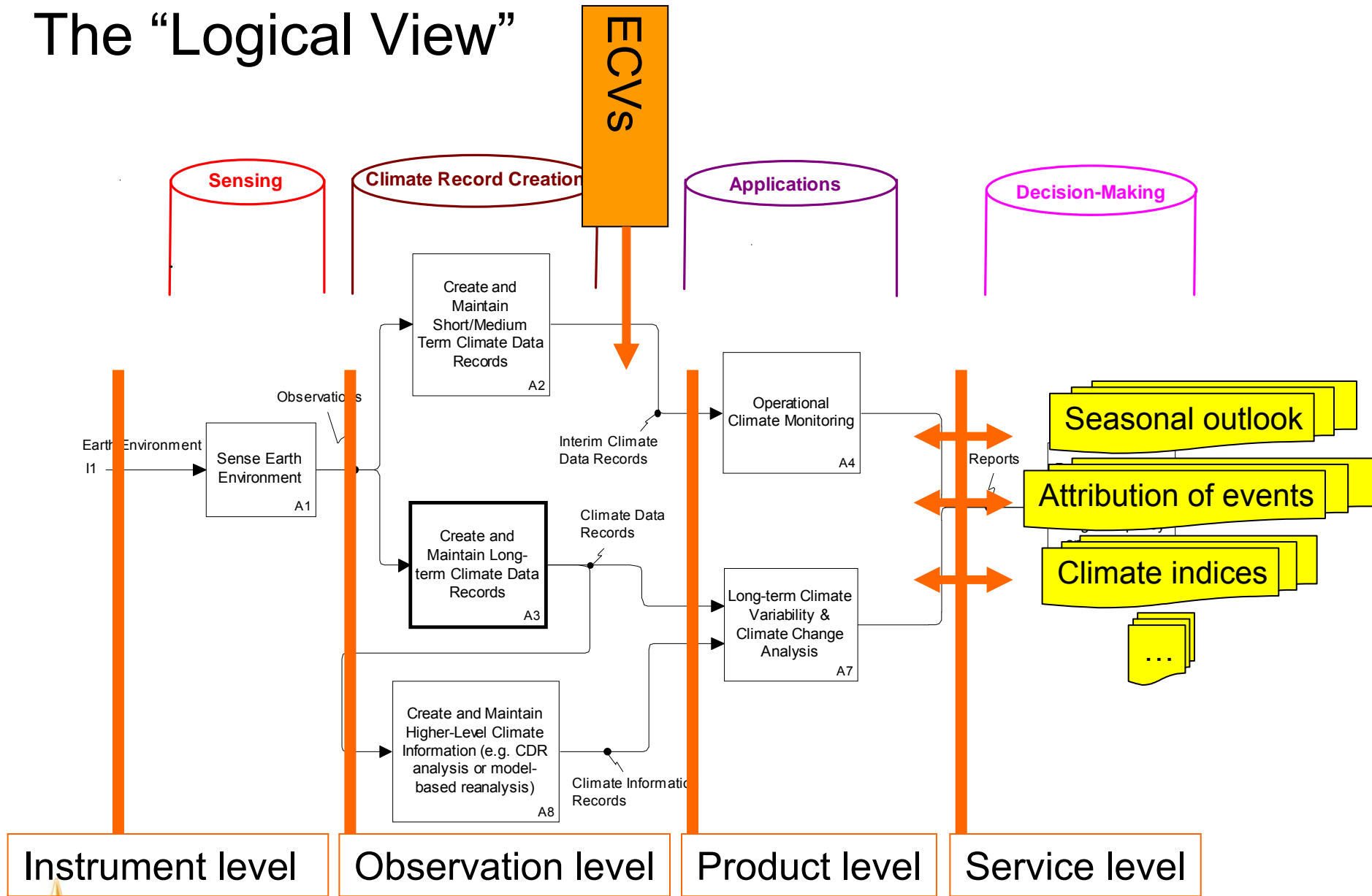
Service level

Product level

- No systematic process in place (for GFCS)
 - The WMO Rolling Review of Requirements process nominally encompasses observations and products up to level 2 (“technology-free”)
 - However some requirements (e.g., GCOS) are a mix of level 2 and level 3
 - Can current variable-based approach capture service-level requirements (e.g., “length of dry spell”, “number of days with PM10 exposure above 50 $\mu\text{g}/\text{m}^3$ ”)?
 - Can current variable-based approach capture socio-economic data (e.g., population density; crop yield; value of infrastructure)?



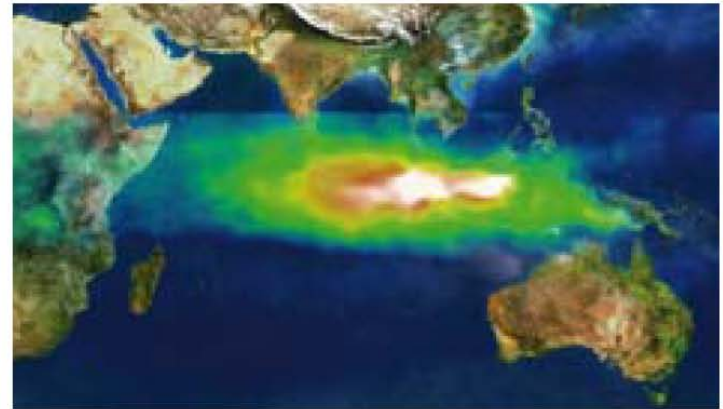
The "Logical View"



CASE STUDY: SOUTH-EAST ASIA FOREST FIRES OF 1997

South-East Asia witnessed one of its worst smoke and haze episodes in autumn 1997 due to forest fires that were exacerbated by the El Niño-related drought. It is estimated that more than two million hectares of forests burned in the Indonesian islands of Kalimantan and Sumatra, emitting the equivalent level of carbon dioxide as a whole year of CO₂ emissions in Europe.²

Meteorological services tracked the resulting smoke and haze, which adversely affected the health of populations of Indonesia and neighbouring countries. In Indonesia, among the 12 360 000 people exposed to the haze, it was estimated that there were over 1 800 000 cases of bronchial asthma, bronchitis and acute respiratory infection. Health surveillance in Singapore from August to November 1997 showed a 30 per cent increase in hospital outpatient attendance for haze-related conditions, as well as an increase in “accident and emergency” attendances.³

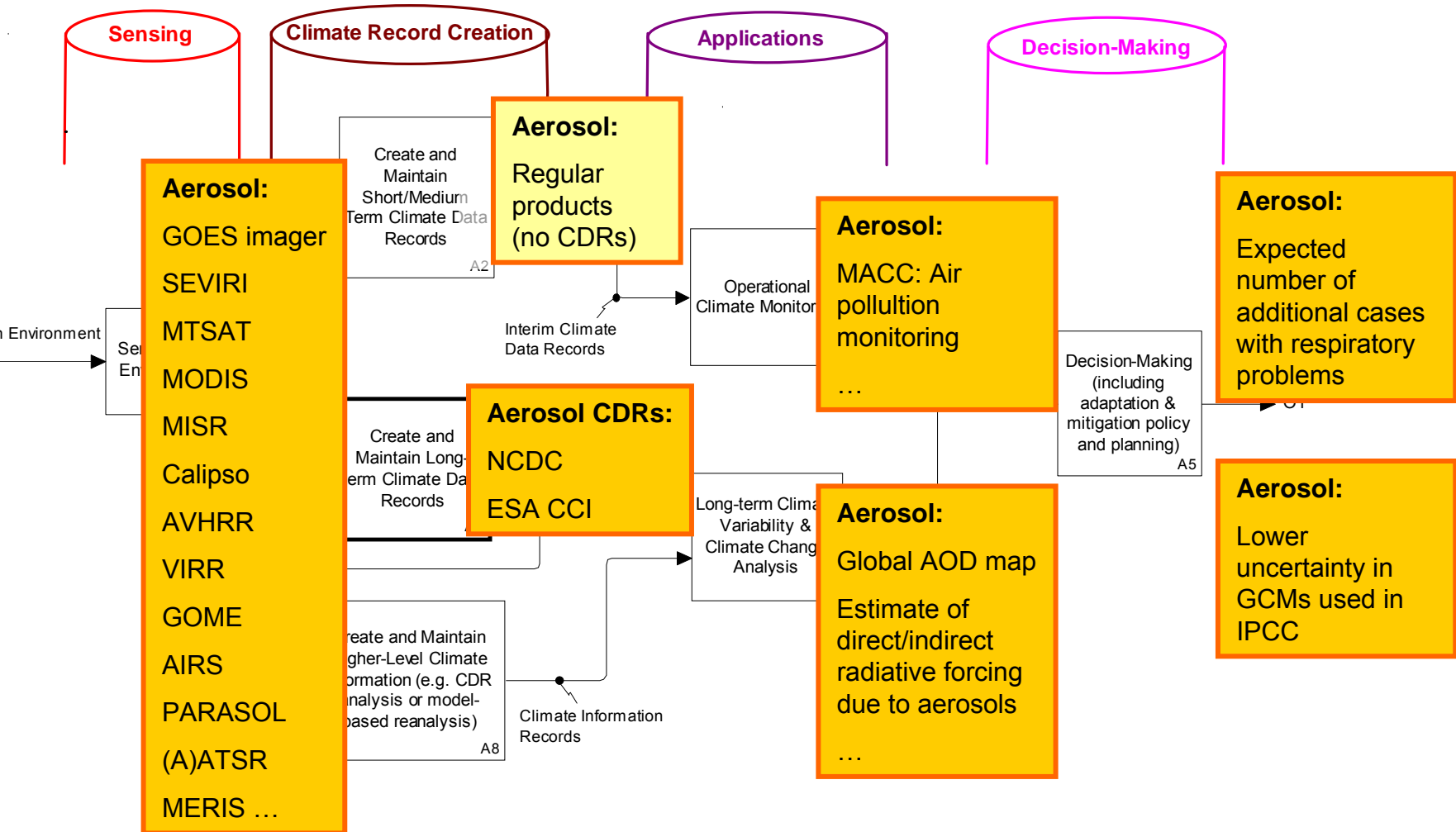


The image shows the pollution over Indonesia and the Indian Ocean on October 22, 1997. White represents the aerosols (smoke) that remained in the vicinity of the fires. Green, yellow, and red pixels represent increasing amounts of tropospheric ozone (smog) being carried to the west by high-altitude winds.⁴

- Source: Atlas of Health and Climate; Section 2 (Airborne dispersion of hazardous materials) http://www.wmo.int/ebooks/WHO/Atlas_EN_web.pdf
- TOMS Aerosol Index



The “Logical View” (populated with a CDR)



Summary

- A process may be needed to
 - Systematically collect climate service requirements
 - And translate these into product requirements
- Some of these requirements may not be answerable from space
- GCOS workshop on “Observations for Adaptation”
- Some in-situ observation requirements go beyond ECVs (e.g., phenology; soil temperature; socio-economic)

- Nevertheless, **from a space perspective:**
 - GCOS-154 (SatSup 2011) provides global reference
 - The ECVs are comprehensive
 - Downstream end of Architecture needs attention





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