World Meteorological Organization

Weather • Climate • Water

Climate Case Studies for Establishing an Architecture for Climate Monitoring from Space

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CEOS-CGMS WG Climate, 25 Mar 2015

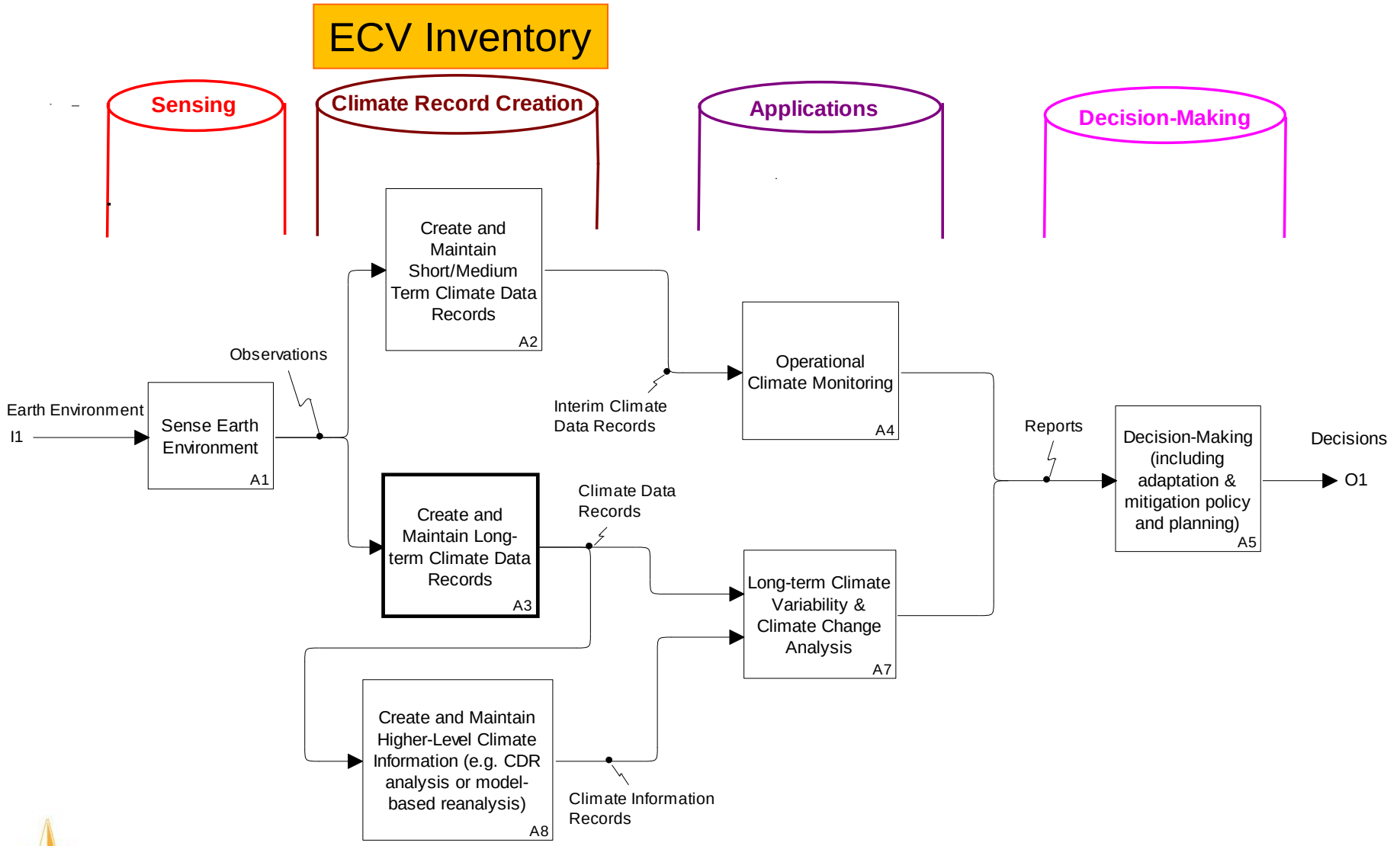
Case studies for Establishing an Architecture for Climate Monitoring from Space

- Motivation:
  - «Strategy Towards an Architecture for Climate Monitoring from Space" (2013) articulated an end-to-end flow of information from space-based observations to end-user decision making in climate-sensitive sectors
  - Demonstrate the validity of the end-to-end flow, through "***mapping of dedicated case studies resulting from the climate service requirements onto both logical and physical views"***

- Objectives of Report:

  Starting from the end user perspective:
  - Demonstrate the importance of satellite-based observations for climate services
  - Demonstrate the importance of the «sensing-processing-applying» value chain
  - Validate the logic of the Architecture
  - Demonstrate the value of the Architecture to external communities

The “Logical View”



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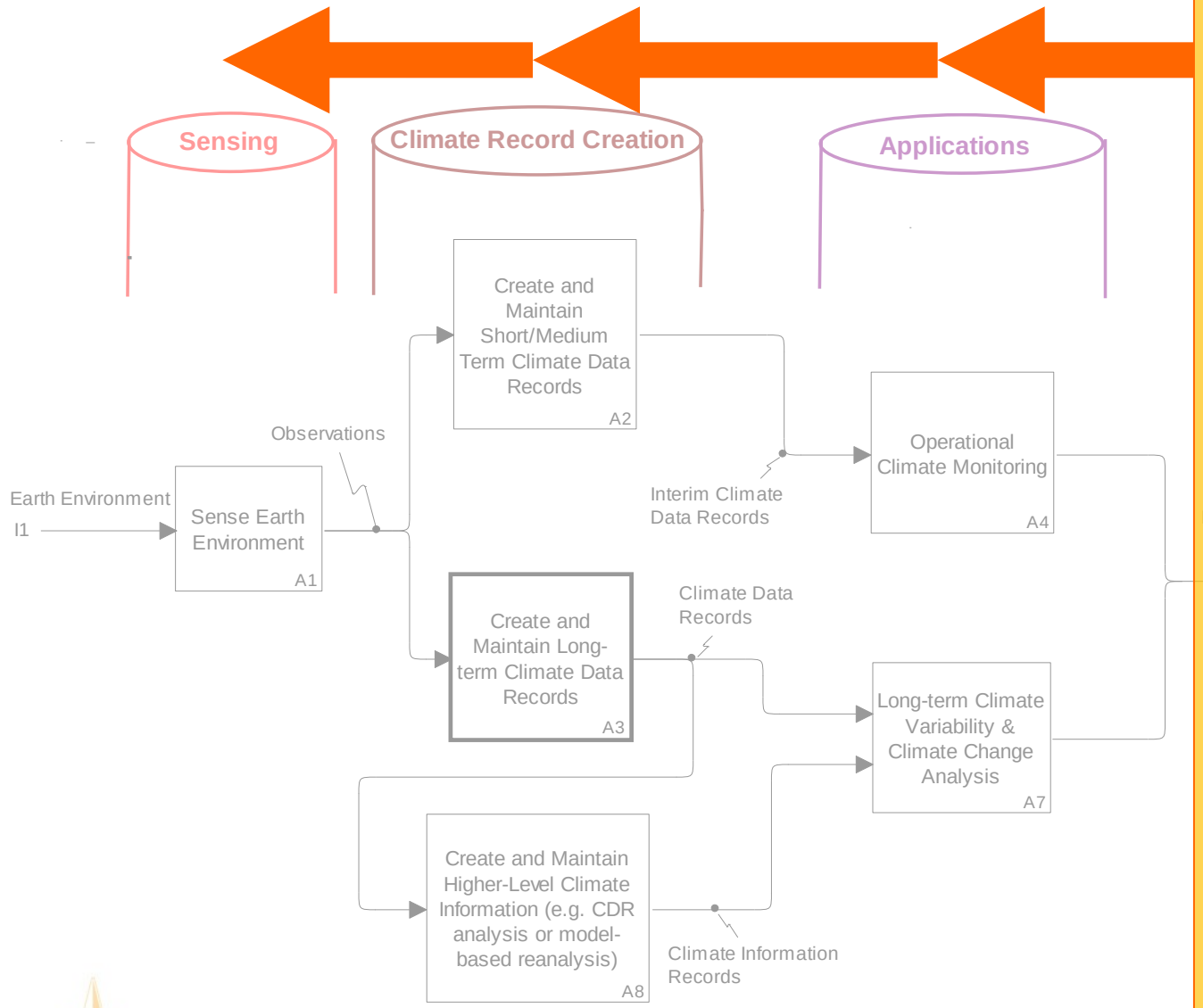


Climate Case Studies

- Water management
- Food security
- Disaster risk reduction (floods, droughts)
- Health
- Energy
- Ecosystems
- Transport
- Mitigation
- Adaptation
- Protocol monitoring

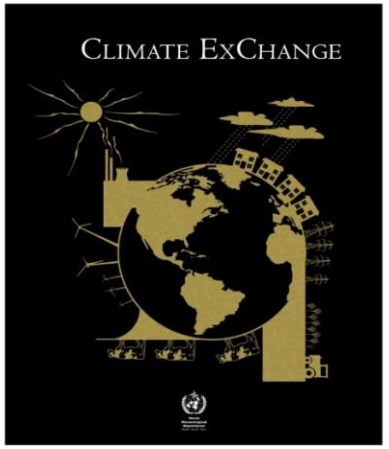
Initial GFCS Priorities

Case studies for Establishing an Architecture for Climate Monitoring from Space

- Audience
  - GFCS management bodies
  - WMO delegates
  - Policy makers
  - End users, external communities
  - Management level of institutions involved in climate services
  - Space agencies (Joint WG Climate)

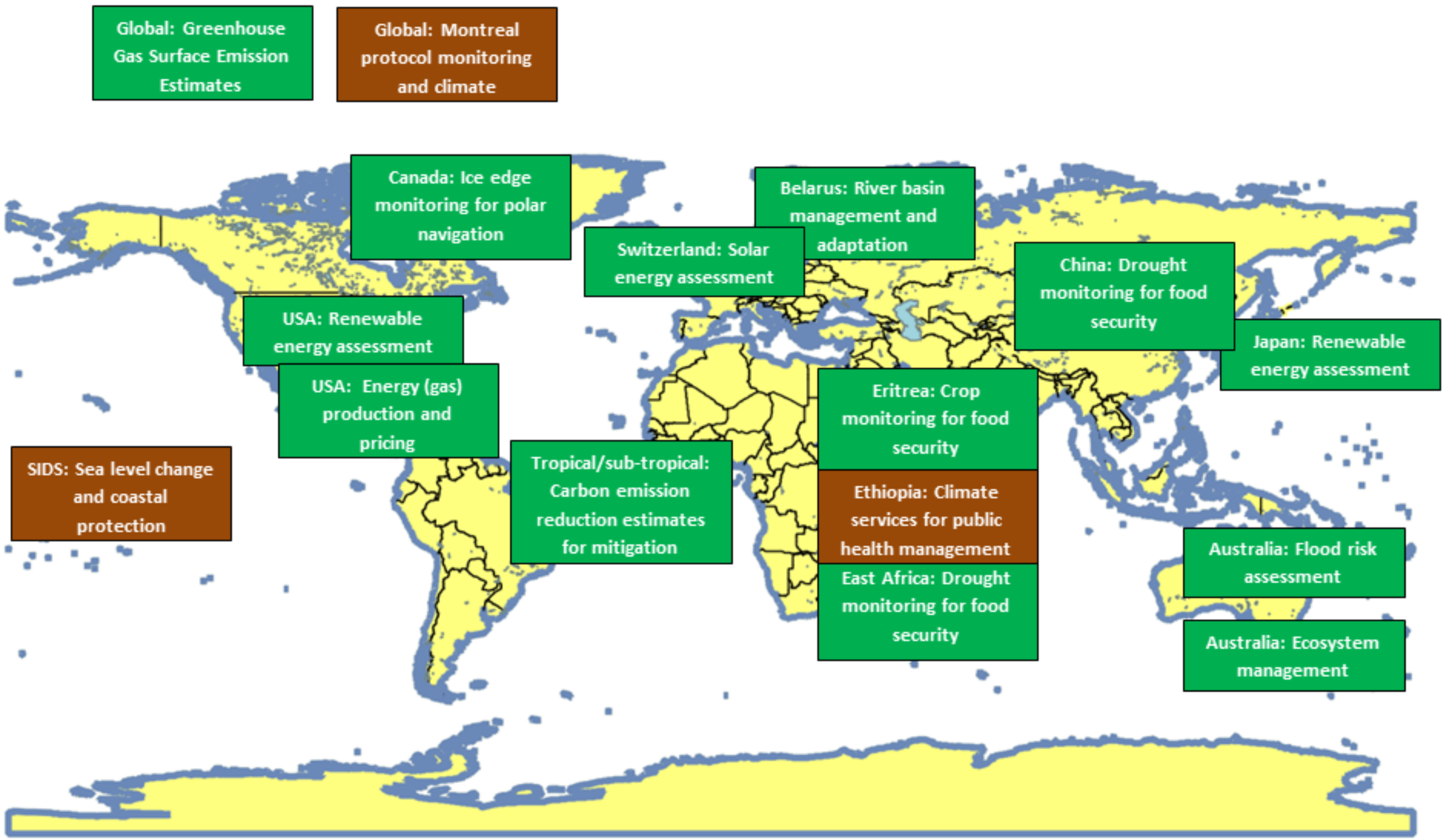
- Writing team
  - From Joint WG Climate, and WMO Expert Team on Satellite Utilization and Products (ET-SUP)
  - Authors: Stephan Bojinski, Mark Dowell, Richard Eckman, Robert Husband, Jerome Lafeuille, Pascal Lecomte
  - Contributors: John Bates, Jean-Louis Fellous, Ignatius Gitonga, >15 others

Case studies for Establishing an Architecture for Climate Monitoring from Space

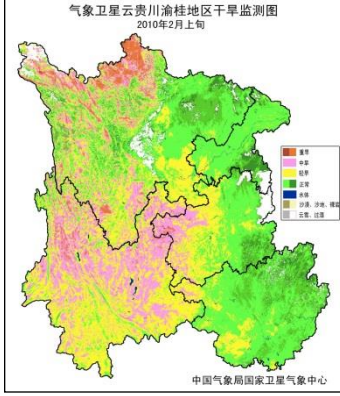


- Process
  - Initiated in May 2013
  - Sources: WMO publication *Climate ExChange,* Environmenta protocols, Existing climate services, National and regional climate adaptation policies, Communities (e.g, SIDS), GFCS office, WMO, writing team members
  - Defined a case study template ensuring consistent set of information
  - To provide coverage of case studies in the following dimensions:
    - Climate application and service areas
    - Geographical spread
    - Developing and developed countries, and economies in transition
    - Global, regional, and local scale
    - From practitioner to policy levels
  - Writing team meeting held in Geneva 2-4 Dec 2014 to review submissions, draft introduction, executive summary, and conclusions
  - Planned finalization by 17th World Meteorological Congress starting 25 May 2015

Case Studies Overview

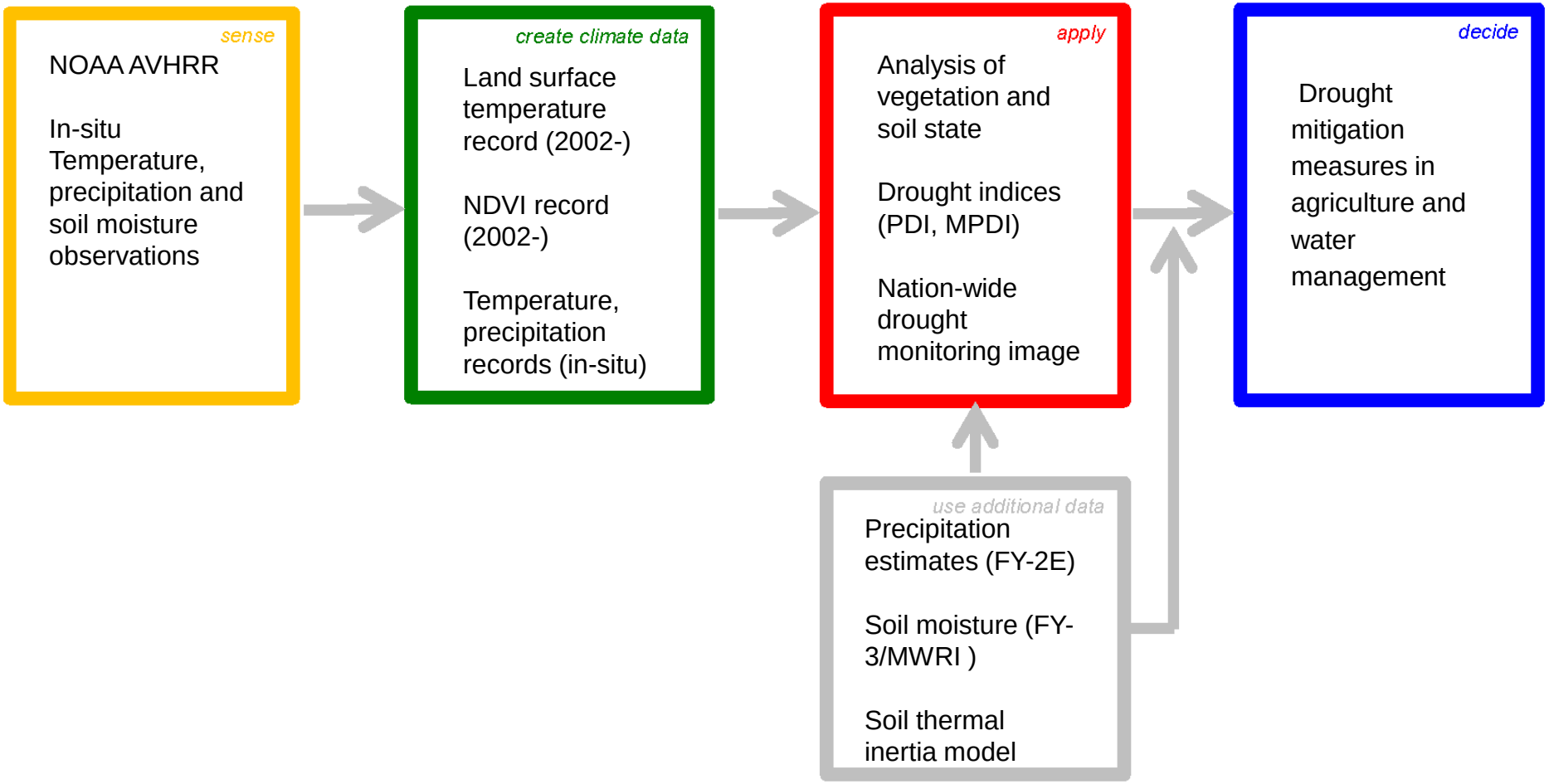


Example (using Template)



- **Title**: Drought Monitoring and Assessment in China
- **Service**: Monitoring of drought indicators (basic mode), generation of additional information (analyses) in case of drought (special mode)
- **End users:** Decision-making service of CMA; provincial governments and agriculture services
- **Intermediate users:** National Climate Centre; provincial meteorological bureaus
- **Application:** Operational climate monitoring
- **Models used:** Thermal inertia soil model
- **Climate Data Records used**: Land surface temperature (2002-); NDVI (2002-)
- **Satellite Observations used:** NOAA AVHRR, FY-2E (basic mode); and FY-3 MWESI and MWRI (special mode)
- **Agency that produces records:** CMA National Satellite Meteorological Center, CMA National Climate Center
- **Information flow:** (next slide)
- **Sustainability of service:** Operational service; Dissemination via reports and website; improvements considering spatial, seasonal and physical geography; construct long-term drought monitoring database
- **Descriptive text:** …

Information Flow: CMA Example

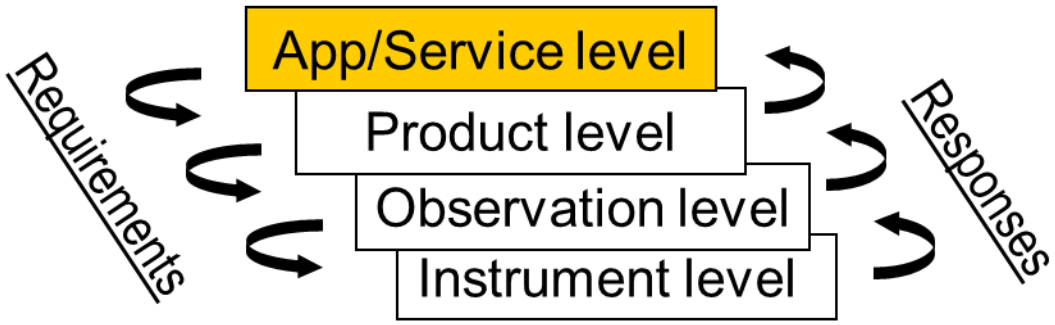


Initial conclusions

- Architecture end-to-end flow (« logical view ») overall valid
- Requirements need addressing at all levels in end-to-end flow
- No case where satellite data are the sole data source
- In-situ data are critical: flow can be mapped onto logical view
- Ancillary, socio-economic data are critical (e.g., exposure, population, urban infrastructure, elevation); some are satellite-derived; added in logical flow
- Both « operational » and « R&D » missions are very important
- User management / feedback mechanisms are essential

Open issues

- Is there a climate information cascade: global – regional – local ?
- How to improve user requirements management?
  - No systematic process in place (globally)
  - Elements are:
    - GFCS User Interface Platform
    - Copernicus User Forum, other core service mechanisms
    - National climate service frameworks
    - User mechanisms by space agencies
    - The Architecture



Summary

- Fifteen case studies across a broad range of societal benefit areas and geographical regions in draft Report
- Writing team has reviewed contributions and developed introduction, conclusions, and executive summary
- Team members presently working on a consistent «look» for the studies, using common template for text box and information flow diagrams.
- Report is undergoing writing team review
- Only one round of review: 17 April – 11 May 2015
  - WMO, WCRP, GCOS, GFCS, JWGC, UN Partners (WHO, ISDR, FAO), Contributors
- Release of a polished draft of the report in timeframe of WMO 17th Congress (25 May – 12 June 2015)

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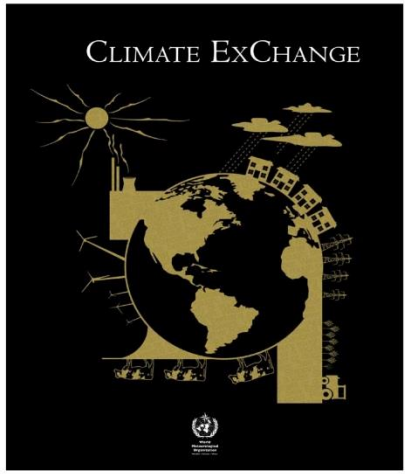
Case studies linking GFCS to Architecture for Climate Monitoring from Space

- Use case studies in *Climate ExChange* book : agriculture, water, health, energy, disaster mitigation (2 each)
- Audience :
  - GFCS management bodies
  - End users
- WMO ET-SUP task team since May 2013
  - Start with studies and develop upstream
  - Consider societal benefit studies by NASA, ISRO, ESA, CSA
  - Deliver paper in Dec 2013



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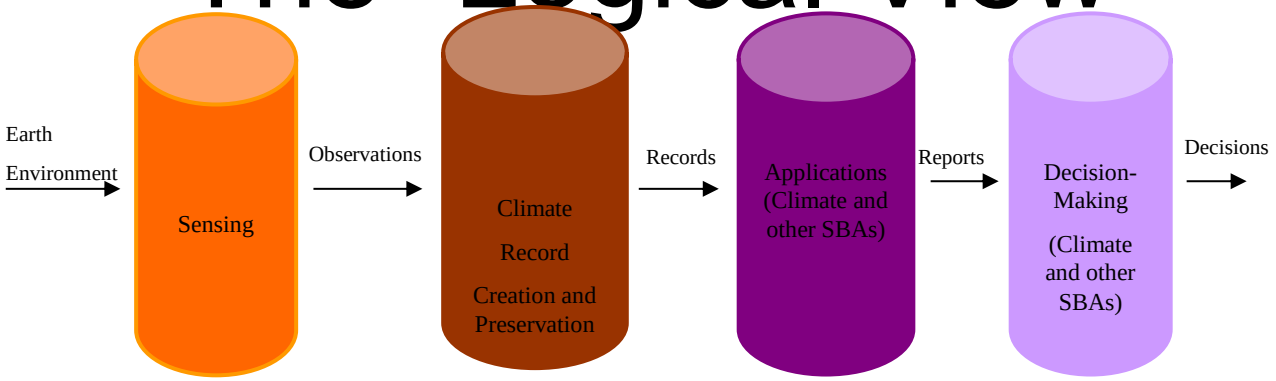
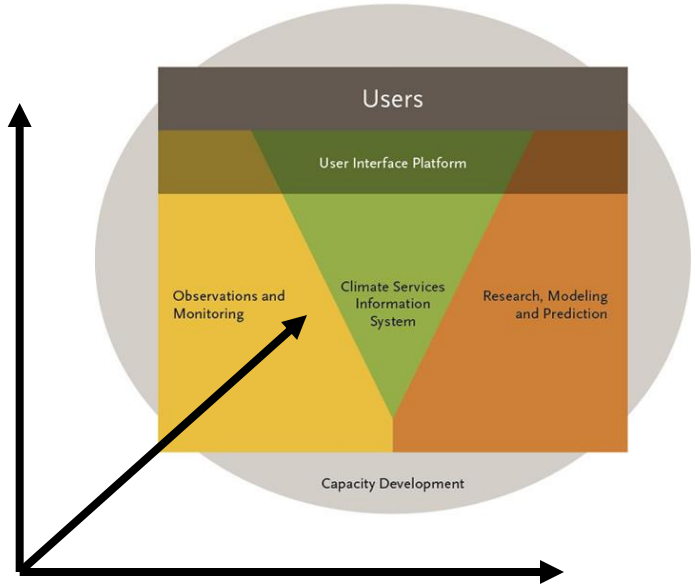


GFCS Schematic



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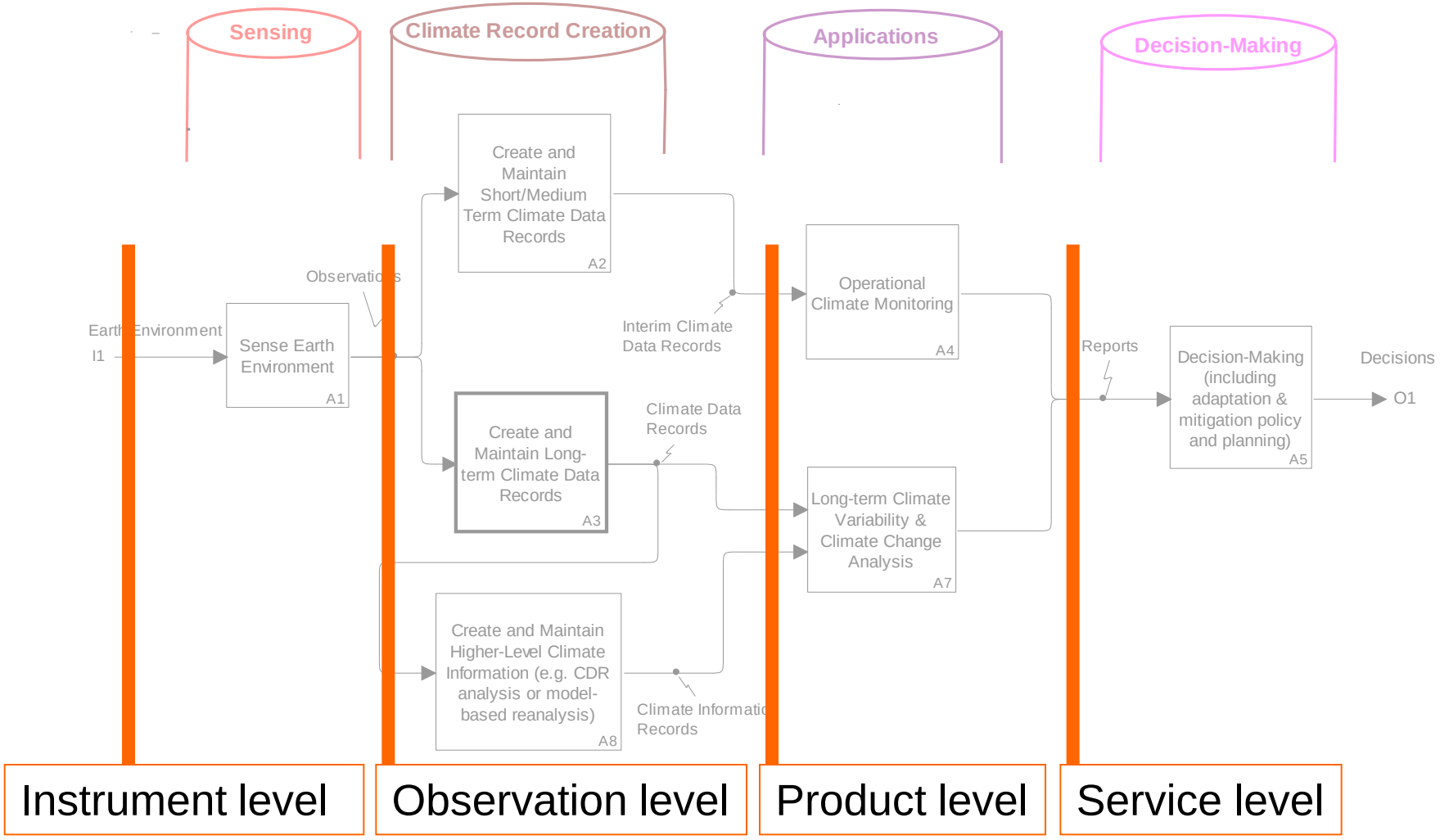
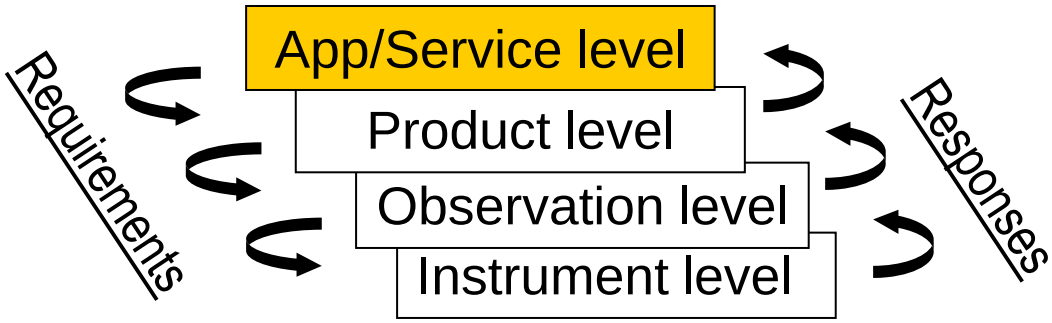


Service requirements in the areas of…

Agriculture & Food Security, Water, Health,

Disaster Risk Reduction (4 initial GFCS priority themes)

…need translation into product / observation / instrument requirements:



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?