

# High-Level Panel for the IndoOS

## Terms of Reference

- (1) Assessment of implementation progress: gaps, redundancies, opportunities
- (2) The use of IndoOS data for ocean state estimation and socio-economic applications
- (3) The importance of IndoOS for climate research, including SIBER
- (4) Providing for free, open and timely exchange of data
- (5) The merits of establishing a Resource Board to coordinate implementation requirements and resources for IndoOS
- (6) Identify near Term Priorities

## Panel Members

- Dr PS Goel, Secretary Ministry of Earth Sciences, India
- Dr Chet Koblinsky, Director Climate Program, NOAA
- Dr Neville Smith, Deputy Director (Research and Systems), Bureau of Meteorology, Australia [Rapporteur]
- Dr Kiyoshi Suchiro, Executive Director, International Development, JAMSTEC
- Mark Majodina, Director of International Activities, South African Weather Service (not in attendance)

## Report against Terms of Reference

### **1. Assessment of implementation progress: gaps, redundancies, opportunities**

- The progress since 2002, and since the last review is unambiguously positive. We see:
  - The target Argo and drifter deployments have been reached
  - RAMA is now 1/3 complete
  - There are a number of recent enhancements from India, Australia, and others that provide significant supplementation in a number of areas, particularly for the boundary regions.
  - The increased participation is also to be applauded: e.g., > 10 participants in Argo (incl. Deployment assistance); ~ 6 nations contributing to moorings
  - The IOP itself has been a positive force for participation in IndoOS
- Articulation of the benefits are in early stages, but some indications of benefits for prediction, and significant advances in terms of knowledge are evident.
- Within the remit of the IOP, the HLRP cannot see any major gaps that have not already been identified by the Panel. The emergence of boundary monitoring as a strength among the activities fills a gap that was evident in early planning. Western Indian Ocean sampling is less than desired, particularly wrt boundary regions.
- There was a significant gap in the presentations around remote sensing, particularly with respect to an integrated approach to observing the Indian

Ocean. It was difficult for the HLRP to see how consideration of the existing and planned satellite missions has impacted thinking on the in situ array design.

- It would have been nice to see greater emphasis on sea surface fields, even SST, since this remains a critical element in prediction on daily to intraseasonal time scales
- The HLRP noted a seeming decrease in importance attached to surface fluxes emerging from the FAR. This might encourage a re-examination of the role of surface observation platforms for the region.
- There is redundancy, but it would seem that which exists now has scientific benefits in excess of any budget advantages that might accrue from lessening this redundancy. The HLRP suggests that the intersections of, say RAMA and Argo be studied more closely, in terms of the strength it adds, and opportunities for bridging temporal and spatial gaps.
- Conclusions:

**Recommendation/Finding 1.** The HLRP should welcome the tremendous progress that has been achieved, in terms of the IndOOS, and in terms of leadership for ocean and climate science in the region through the work of the Panel. The engagement of Indian Ocean agencies in the work is to be welcomed and should always be seen as a measure of success.

**Recommendation/Finding 2.** The HLRP does believe increased emphasis and attention should be given to the remote sensing aspects of the IndOOS. It is clear that remotely sensed data has already played a critical role in developing knowledge, but the degree to which it has shaped the thinking surrounding the development of the IndOOS was absent from the presentations.

**Recommendation/Finding 3.** The HRLP welcomes the attention given to socioeconomic issues and the data and information aspects of the system. Both were seen as challenges at the time of the last Review and we welcome the significant response facilitated by the IOP.

**Recommendation/Finding 4.** With respect to redundancies, the HLRP is of the view that there is an appropriate level of redundancy within networks, and between networks. However, the Panel also believes the IOP should begin to understand this redundancy more directly, particularly between and other elements of the OS, with particular attention on quality control.

## **2. The use of IndOOS data for ocean state estimation and socio-economic applications**

- The socio-economic presentations were interesting and instructive. It is clear that the socio-economic development of the Indian Ocean region is sensitive to climate variability and climate change. We have seen a number of ways climate information can be used to both mitigate the negative impacts for vulnerable sectors, and to improve efficiency and productivity where the sensitivity provides opportunities.
- It is less clear there can be a direct line drawn from the OS to socio-economic impacts, but this is a challenge that is not unique to IndOOS. It suffices at this time to be well informed about the potential benefits and to be aware that unique attribution of effect is rare.

- There was less emphasis on ocean state estimation within the presentations. Indeed, this aspect might be seen as a weakness were it not for the fact that the HLRP is aware the climate and ocean state estimation efforts are well linked to the IOP.
- In other regions, particularly in the North Atlantic there have been a number of studies that tease out the relevance of elements of the OS to particular phenomena and mechanisms. Such studies for the Indian Ocean would be beneficial, particularly with a view toward decadal prediction. E.g., are there adequate deep observations?

**Recommendation/Finding 5.** The HLRP recommends strengthening of the links to ocean state estimation science, with perhaps a future meeting of the panel getting perspectives from specialists, including from the satellite community. Particular emphasis should be given to satellite data and developing a qualitative sense of impact of various elements for decadal predictability.

### **3. The importance of IndOOS for climate research, including SIBER**

- As discussed under 1, the importance of the IndOOS for research is unambiguous. There remains a belief that the Indian Ocean has climate modes that operate independent of other climate modes.
- The emergence of decadal variability as a more prominent aspect of research does in our view add greater weight to relevant data than before. Understanding the level of predictability will be important for the future.
- The emergence of process studies for boundary currents and air-sea processes and intraseasonal variability is a +ve aspect.
- The emergence of SIBER is to be welcomed. The use of data for management and associated research should only be strengthened by this emerging partnership.
- SIBER is an outstanding opportunity for the future. The scientific rationale is strong with both socio-economic and knowledge benefits evident.
  - o The strength of the IMBER endorsement provides great confidence for the potential involvement of IOGOOS. Irrespective of the latter, there are clear benefits for the work of the IOP.

**Recommendation/Finding 6.** The HLRP welcomes the strong links between the development of IndOOS and research, from climate to ocean prediction, and extending into biogeochemical and ecological domains. The IOP should consider appointment of a Rapporteur or Member from SIBER.

**Recommendation/Finding 7.** The HLRP believes we should recommend that IOGOOS immediately consider SIBER as an initiative in its work program, and undertake to bring nations of the Indian Ocean into the program, as part of IndOOS extended. This would be subject to the review of the Science Plan.

### **4. Providing for free, open and timely exchange of data**

- The HLRP welcomed the presentations on data and data exchange. It agrees that exchange of data is critical for advancing climate and related research.

**Recommendation/Finding 8.** The HLRP believes there are opportunities for strengthening the sharing of data between IOP activities and coastal projects and would encourage both the IOP and IOGOOS to examine opportunities.

**Recommendation/Finding 9.** The HLRP emphasised the importance of quality control, integration and assembling of data sets and encouraged even greater emphasis in the future.

## **5. The merits of establishing a Resource Board to coordinate implementation requirements and resources for IndOOS**

**Recommendation/Finding 10.** A Sub-Committee for IndGOOS Resources.

- The rapid development of IndOOS is based on scientific understanding and this is mandatory. IndOOS development thereafter is inextricably linked to the investment and broad multi-national institutional support. Bilateral agreements are valuable but not sufficient to guarantee successful and efficient coordination implementation.
- The HLRP takes the view that a “club” like CEOS is the most appropriate model, with the common interest being the ocean observing system of the Indian Ocean (general, but with initial focus on climate).
- The Indian Ocean GOOS provides the broad framework for participation, though we note it is for IO agencies primarily
- The “club” would be a sub-Committee with the specific charge of coordinating the deployment of resources for the IndOOS.
  - o The sub-Committee for IndOOS Resources would ...
    - To consider the resource requirements for the implementation of IndOOS and develop forward estimates of the committed, in principle commitments and highest priority unmet needs;
    - To the extent possible, harmonise and coordinate the deployment of resources dedicated to the program;
    - To report on the deployed resources to the Heads of the Institutions, through IOGOOS.
  - o Scientific guidance is provided by the IOP initially, but we may anticipate an expanded remit over time.
  - o The Committee would be open. Secretariat support would be provided through the IOGOOS and IOC Perth Regional Office Secretariats;
  - o The Sub-Committee would need to be supported by regular scientific reviews of the IndOOS, order 2-3 years;

## **6. Identify (other) near Term Priorities**

**Recommendation/Finding 11.** IOGOOS should consider the convening a technical Working Group, ideally working with the IOP, SIBER and the IOTWS-ICG to examine and exploit the use of IndOOS platforms as “platforms of opportunity” for expanded instrumentation. This WG might also considers measurements of opportunity on vessels working in the region.