

WORLD METEOROLOGICAL ORGANIZATION
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**VIRTUAL LABORATORY MANAGEMENT GROUP
THIRD SESSION (VLMG-3)**

BOULDER, CO, U.S.A.

7-8 JUNE 2007

FINAL REPORT
(Revision 1)





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Mr Daniel Barrera
Middle row (left to right) Mr Hans-Peter Roesli, Mr Richard Francis, Mr Jeff Wilson,
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Back row (left to right) Dr Adamou Garba, Dr James Purdom
Not in photograph Mr Lawrence Pologne, Dr Vilma Castro (remote participant)

1. INTRODUCTION *(agenda item 1)*

1.1 The Co-Chairs welcomed participants to the meeting and thanked COMET for kindly hosting the event. The group was informed of the expected late arrival of the representative from Barbados who had been delayed en route. The group also noted that the representative of the Centre of Excellence (CoE) in Costa Rica, although unable to be present, would contribute to the meeting via audio link. The group further noted – with disappointment – that the representatives from the CoE's in Kenya and China as well as the representatives from the satellite operators in India, Japan and China were also unable to attend. A list of participants at the meeting is shown in Appendix I.

Adoption of the agenda

1.2 The Co-Chairs proposed that agenda items 8 and 9 would be discussed in reverse order and also that in discussing agenda item 10 (Selection of Co-Chairs) the group should consider making recommendations to WMO and CGMS that the outgoing Co-Chairs would be asked to serve *ex-officio* to advise new incumbents, especially during the first months of their Chairmanship, and hence ensure a smooth handover and minimum loss of momentum. These points were agreed and the amended agenda was adopted. The revised agenda is shown as Appendix II.

Background

1.3 The Co-Chairs described the history of the VL and that of the VLMG. In 2000 CGMS XXVIII endorsed the concept of the Virtual Library and placed an action on WMO and the CGMS Secretariat to create a VL Focus Group to bring the concept to reality. That group (later to be renamed the Virtual Laboratory Management Group (VLMG)) met in Darmstadt in 2001 and reported back to CGMS XXIX later that year with proposed Structure and Goals which CGMS endorsed. The second meeting of the group (VLMG-2) took place in Barbados in 2003 when the Structure and Goals were reviewed and the concept of the Virtual Resource Library (VRL) was refined. That meeting reported back to CGMS XXX with a revised Implementation Plan which included expectations for CoEs and satellite operators and contained an ambitious plan for a major global training event (the HPTE) based on the principles of the VL. It also proposed that a third meeting of the group should take place in 2006 (i.e. after 5 years of life) to review progress and consider the future direction of the VL.

1.4 The Co-Chair went on to describe the activities since VLMG-2 and brought the groups attention to major achievements including:

- The evolution of the Virtual Resource Library (VRL);
- The enormously successful High Profile Training Event (HPTE);
- The introduction of donated electronic notebooks and USB Hard Drives as a means to convey training material and other information to participants at major training events;
- The formation of a Regional Focus Group covering the Caribbean and the Americas, an initiative seen as being of vital significance for the future of the VL;
- Contact with the scientific groups ITWG, IPWG and IWWG, an activity long seen as very important to the evolution of the VL.

1.5 It was noted that the significant growth of the VL, whilst being a cause for satisfaction, is also a source of problems insofar as the associated workload is increasingly difficult for members to absorb within current resources alongside their everyday work. The Co-Chairs expressed the view that the VLMG must consider a strategy for day-to-day management and coordination of the VL activities including a consideration of the need for a full-time responsible person for this task. This subject is covered later in this report.

1.6 The group noted that the email list vl@wmo.int had become out-of-date.

ACTION VLMG-3.1: WMOSP to update the VL email list to reflect current participation.

2. REVIEW OF ACTIONS SINCE VLMG-2 (agenda item 2)

2.1 The Co-Chair summarised the status of actions raised at VLMG-2. These are recorded in the following table.

A global high-profile VL training event

Action	Status
Appoint a focal point (Mr Wilson as VL FG Co Chair) to coordinate the global high profile VL training event and it was anticipated that the focal point would convene an <i>ad hoc</i> working group to assist.	Done
Focal point to identify financial resources required to implement the event.	Done – Finances secured for electronic notebooks at CR 2005, Nanjing 2006 and APSATS 2006 and for USB hard drives for events in Africa and Oman
CGMS VL Rapporteur to inform and seek agreement from CGMS-XXXII of the event and associated need for financial resources.	Done
WMO Space Programme Office to inform the 2004 Consultative Meeting of the event and associated need for financial resources.	Done

Important areas requiring further elaboration by the focal point

Action	Status
VRL issues: <ul style="list-style-type: none"> • Case studies and lectures able to be downloaded, as well as found via the search engine; • Sat operators to provide online access to digital data for the standard VL tools (SATAID, RAMSDIS); • Improve search capabilities on the VRL; 	<p>Partially done – core lectures available but search engine concept was not completed;</p> <p>Partially done – the group expressed the need for ADDE servers at each satellite operator site. Action: The VL rapporteur to CGMS to recommend satellite operators to install ADDE server.</p> <p>Partially done – EUMETSAT, CIRA and JMA updated and improved websites but no search engines developed. EUMETSAT reported on their experience with digital resource libraries through the EUMETCAL project. The US reported on progress COMET was making in this area</p>

<ul style="list-style-type: none"> • Standardise meta data to allow more effective searching; • Provide a brief description of the material on the VRL that is available only on request; • Peer review mechanism. <p>Institute routine coordination between “centres of excellence” and sat ops (at least 3 monthly) – Co – Chairs;</p> <p>Collaborate on series of training related projects (3 monthly for those who can);</p> <p>Common VL interface on the web pages (Mr Wilson to email to group);</p> <p>“What’s new and FAQ” to be added to the VL websites;</p> <p>Sat Operators to install the RAMSDIS-Online type system and tailor to meet their needs and those of the “centres of excellence” (CIRA to provide code);</p> <p>Have EUMETSAT investigate and report back on the feasibility of using EUMETCast to disseminate training material (by end of 2004).</p>	<p>Partially done – a taxonomy scheme has been developed and implemented in the EUMETCAL digital library but was not generally available to all VL members</p> <p>Not done;</p> <p>Done for the HPTE lectures but not generally on VRL</p> <p>Partially done – once a year EUMETSAT CoEs come together. Americas and Caribbean have regular contact with focus group. BMTC reported ongoing interactions with JMA</p> <p>Successful HPTE shows potential – more progress needed (covered by outcome of VLMG-3).</p> <p>Done.</p> <p>Not done.</p> <p>CIRA provided code.</p> <p>Functionality there but no material yet disseminated. Expect trials in next two to three months for whole footprint. Also possibility to ask NESDIS and CMA to incorporate into their multi-cast systems.</p>
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ACTION VLMG-3.2: The VL rapporteur to CGMS to recommend satellite operators to install an ADDE server.

PARTICIPANTS PRESENTATIONS (agenda item 2 - continued)

2.1 All CoEs and satellite operators present at the meeting (plus some of those who were absent) submitted a report of activities since VLMG-2. In some cases these reports also included experiences from the HPTE (primarily covered under agenda items 4 and 5). Brief highlights are given in the sections below with the full reports available on the WMO web site.

2.2 Australia CoE

The report from the Australian CoE describes APSATS 2006, a major training event, co-hosted by WMO, JMA and the Australian Bureau of Meteorology, that ran in parallel with the HPTE. It included a potentially important interaction with the IPWG. The HPTE itself is described along with some experiences and recommendations. The implementation of the Internet-based SATAID data server as well as a VISITview weather discussion server, both focussing on the Asia/Pacific region was also noted. The report highlights how resource (staffing) difficulties experienced by the CoE have impacted on their ability to run regular Regional Focus Group discussions in the Asia/Pacific region prior to mid 2007, regular discussions are expected to commence in August 2007. The full report from the Australian CoE may be found at:

http://www.wmo.int/pages/prog/sat/meetings/documents/VL_Australia.pdf

2.3 Japan, VL Sponsor

Although no representative from JMA was present at the meeting a report from JMA was received in advance of the meeting. The report describes the annual training event hosted by JMA which includes satellite meteorology lectures involving the SATAID tool. It also describes recent updates and enhancements to SATAID including the capability to display microwave imager data and to overlay ocean surface scatterometer winds on satellite imagery. The full report from the JMA satellite operator may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/jma.pdf>

2.4 Costa Rica CoE

Although no representative from Costa Rica was physically present at the meeting a report from them was received in advance of the meeting and they participated remotely via audio conference. The report describes their continued involvement with the VL regional monthly weather discussions and those that took place during the HPTE. They have been fostering the participation in the VL of Hydrology groups from the region. The report describes the translation of the core HPTE lectures into Spanish and notes the enormity of that task. The report also describes how enthusiastically electronic notebooks were received by course participants and how valuable they have proven to be. The CoE plans to cooperate with the organisation of the S. American HPTE in October 2007 and will participate in the event. The report mentions a few problems experienced by the CoE, the most significant being the lack of staffing resources. The full report from the Costa Rica CoE may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/VL-CostaRica-REPORT07.pdf>

2.5 Argentina CoE

Note. A brief verbal report was provided by the representative of the Argentina CoE at the meeting. After the meeting a more comprehensive written report was submitted. This latter report is reflected here.

The report describes the background to satellite meteorology training in Argentina, including the role played by the Department of Atmosphere and Oceans Sciences (DCAO), and it outlines the steps leading to the achievement of CoE status. The report goes on to describe some of the activities and advances in satellite meteorology that have taken place in Argentina over the past two years. It outlines recent change of governance of the Argentinean NMHS from military to civilian authority and mentions the strong collaboration between the NMHS and the University of Buenos Aires that has recently been established. The change of governance is seen as a positive indicator for Argentina's continued involvement with the VL. The report notes that the Argentinean VLMG representative is also a member of the IPWG, a fact that should enable a closer working relationship between the VL and that group. Finally the report describes the teaching facilities

available for training events and outlines the planned future activities in the VL context. The full report from the Argentina CoE may be found at:

http://www.wmo.int/pages/prog/sat/meetings/documents/Report_CoE_Argentina.pdf

2.6 Niger CoE

The report from the EAMAC CoE describes some outcomes of the 13th Meeting of ASECNA Schools Teaching Council in 2004 which were of significance to the VL. It also mentions the efforts of EAMAC to improve their internet connectivity but notes only very limited success. The involvement of the CoE in the HPTE is described, including measures taken to prepare for the event as well as the engagement in the event itself. Considerable technical problems were experienced and remain a concern to the effectiveness of VL activities at this CoE. The absence of French versions of the core lectures was a significant hindrance to the participants. The CoE representative proposed to investigate the options for coordinating the translation of the four core HPTE lectures into French. The CoE is committed to engage in the creation of a Regional Focus Group. The full report from the EAMAC CoE may be found at:

http://www.wmo.int/pages/prog/sat/meetings/documents/EAMAC_Report.pdf

ACTION VLMG-3.3: The CoE in Niger to investigate the options for coordinating the translation of the four core HPTE lectures into French.

2.7 Oman CoE

The report explains that Oman has been a VL CoE since 2006. It describes the impressive facilities available to the CoE for training purposes and lists the training events that have recently taken place or are planned. It goes on to describe the participation of the CoE in the HPTE. The CoE is committed to the establishment of a Regional Focus Group with the assistance of EUMETSAT and is planning to introduce a live VL web page September this year. The full report from the Oman CoE may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/oman.pdf>

2.8 EUMETSAT, VL Sponsor

The report mentions the developments of EUMETCAL and EUMETrain, two initiatives closely related to the VL objectives. It describes how USB hard drives are regularly distributed to training course participants. The report draws attention to the workshop on the use of satellite data for climate applications that took place in Croatia in December 2006. It also includes a comprehensive report on the experiences from the HPTE. It details plans for 2007/8 including the promoting of Regional Focus Groups in Africa. EUMETSAT brought the group's attention to their recent efforts to intensify contacts with the South African Weather Service (SAWS) in Pretoria. It is their hope and expectation that this initiative will result in the closer involvement of SAWS in the VL, perhaps including the establishment of a new CoE there. The report contains some expressions of concern over the maintenance of the VL web site. The full report from the EUMETSAT satellite operator may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/eumetsat.pdf>

2.9 Brazil CoE

The report gives a detailed description of the facilities available at the CoE for training events. It describes both the face-to-face and also the online training events that have taken place in 2006/7 and those planned for 2007/8 (including an HPTE-type event in October 2007). The report also contains a very comprehensive description of the CoE involvement in the HPTE including a very useful questionnaire response analysis. The full report from the Brazil CoE may be found at:

http://www.wmo.int/pages/prog/sat/meetings/documents/Brazilian_VL.pdf

2.10 NOAA, VL Sponsor

The report lists the many activities undertaken since VLMG-2. It describes the involvement of NOAA in the HPTE and also the sponsorship to the new CoEs in Brazil and Argentina. It mentions the move of GOES-10 to 60 W, a very important element of the support to satellite meteorology training in the region. It goes on to report its continued involvement in the

Americas/Caribbean Focus Group. In addition the report includes news of several interesting developments in COMET and VISIT training activities which together represent a significant addition to the resources available to the VL. The full report from the NOAA satellite operator may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/noaa.pdf>

2.11 China CoE

Although no representative from CMA was present at the meeting a report from the Nanjing CoE was received in advance of the meeting. The report describes the two major satellite training events that have taken place at Nanjing since VLMG-2, namely the event in June/July 2004 and the HPTE in 2006. It mentions that academic exchanges and cooperation with NSMC in Beijing have increased and that these have included the provision of expert lecturers from Beijing for training courses in Nanjing. The training facilities at the RTC in Nanjing are described and the usefulness of the VL training material is also mentioned. The report describes how the CoE encourages presentations from participants at training events on their own studies, ideas and experiences. The full report from the Nanjing CoE may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/VL-Nanjing-2005-2007.pdf>

2.12 Barbados CoE

The report describes the CoE support to the Regional Focus Group monthly weather discussions and notes initial telecoms problems, most of which have been solved. It also notes an apparent decrease of interest from Caribbean participants in recent months. It goes on to describe the use made of VL material by the CoE and their participation in HPTE. An initiative is described through which some dedicated computer hardware has been installed to receive satellite data, routinely downloaded from RAMSDIS, and on which an archive of these data is maintained. The CoE report plans to introduce weekly Caribbean weather discussion sessions during the current hurricane season. The full report from the Barbados CoE may be found at:

<http://www.wmo.int/pages/prog/sat/meetings/documents/barbados.pdf>

2.13 Others

There were no reports received from the representatives of the satellite operators in India and China or from the CoE in Kenya. The Oman CoE informed the VLMG that no official ties have been established between that CoE and India in a co-sponsor role.

ACTION VLMG-3.4: The VL rapporteur to CGMS to clarify India's participation within the VL.

3. DEVELOPMENTS IN THE WIDER SPACE AND EDUCATION COMMUNITY; OPPORTUNITIES AND THREATS FOR GROWTH AND CONTINUITY OF THE VL (agenda item 3)

3.1 The group were informed of recent developments in Europe concerning the establishment of the European Virtual Organisation for Meteorological Training (EUMETCAL) in which the facilitation of distance learning is achieved by cooperation of the national training areas of the NMHSs of EUMETNET. The assets of EUMETCAL are a centralised Web Site (www.eumetcal.org) and an online digital resource library of training material (Intralibrary). EUMETCAL partners have started to organise regular VISITview weather briefings and helped to organise a blended learning course on aviation meteorology. Further courses are in preparation. The course management is making use of a course management system (Moodle). This is an essential development towards the establishment of the EUMETCAL Virtual College. It is recommended to establish a formal contact between the VL and EUMETCAL to discuss possible cooperation in training. This is also of interest because EUMETCAL could be considered as the host of the European Regional Focus Group discussions.

3.2 The group recognised the important role played by Moodle in EUMETCAL and also were mindful of the fact that Moodle is rapidly acquiring a substantial worldwide following as a learning management system that meets a variety of needs. There was a general expectation that Moodle, or a similar tool, could play an important role in the future of the VL.

3.3 EUMETSAT informed the group of an initiative to place online satellite product information via the so-called Product Navigator (www.eumetsat.int/products/). The group found this subject to be of potential interest to the VL and encouraged EUMETSAT to develop the relationship.

3.4 The group were informed of various other recent activities by members including:

- The reception and processing of GOES-10 data from 60°W by CPTEC
- A CIRA web page containing write-ups of the monthly Americas-Caribbean Regional Focus Group weather discussions
- Monthly weather briefings in Europe, based on the SATREP processing tool, conducted using VISITview

3.5 The group noted with interest a EUMETSAT training event in Zagreb, Croatia in December 2006 covering the use of satellite data in climate applications. This was an interesting example of how the scope of training in satellite meteorology is naturally extending in response to evolving requirements.

3.6 In considering the future growth and direction of the VL the Co-Chair suggested that the group should take account of the nine GEO Societal Benefit Areas (SBAs) in their future plans.

The current SBAs are:

- Agriculture
- Biodiversity
- Climate
- Disasters
- Ecosystems
- Energy
- Health
- Water
- Weather

These SBAs provide the basis for GEOSS planning and it was felt appropriate that training in satellite meteorology should be similarly guided. The group felt it would be beneficial to learn how current activities of the VL supported activities in the SBAs.

ACTION VLMG-3.5: CoEs and Satellite Operators to compare their current activities against the nine GEO SBAs and to report to the VLMG which areas are already addressed and which areas are planned to be addressed.

4. REVIEW OF HPTE / LESSONS LEARNT (agenda items 4 and 5 combined)

4.1 The Co-Chair recalled the HPTE Project Development Plan (PDP) and compared the major items from the plan with what happened in reality. These are listed in the following table.

Item	Comments
<p>Executive Summary</p> <p>The HPTE will provide training on three different levels in this period:</p> <p>Classroom training for at least 50 people in RA II and RA V through the regular WMO Regional Training Seminars in Nanjing, China, and Melbourne, Australia.</p> <p>Interactive online lectures to WMO Members in each Region through the local WMO Centre of Excellence (Niger, Oman, Kenya, Barbados, Costa Rica, China and Australia).</p> <p>At least one inter-regional image and product discussion between WMO Members and the VL Partners in those regions.</p> <p>Additionally, the HPTE provides the impetus for the formation of regional focus groups of WMO Members (along the lines of the very successful focus groups in RA III and RA IV) to participate in ongoing online training and, near real-time image and product discussions, at regular intervals after the event, from each of the Centres of Excellence.</p> <p>It is anticipated that the successful running of the HPTE will lead to further co-ordinated online VL training events and will point the way forward for the provision of training for other WMO Programmes, and initiatives such as GEOSS and JCOMM.</p>	<p>See below</p> <p>Achieved</p> <p>Achieved in all except Nanjing.</p> <p>Achieved</p> <p>Asia Pacific and Africa in process, Europe occurring, Middle East (Oman) in process</p> <p>Achieved, As evidenced from the very positive feedback on the evaluation questionnaires and plans for a regional HPTE in South America in Oct 2007</p>
<p>Goals of the HPTE</p> <p>The purpose of the HPTE is to support the training component of the WMO Strategy to Improve the Utilisation of Satellite Data and Products by WMO Members. The HPTE is consistent with, and a logical extension, of the WMO Space Programme objectives.</p> <p>Open to all WMO Members, with maximum participation as technology allows;</p>	<p>See below</p> <p>Yes</p>

<p>Accommodate for language, culture and technological capacity of the wide range of WMO Members;</p> <p>Meet the specific objectives of the HPTE as outlined below:</p> <p>Further the effectiveness of the VL as a training tool for use by WMO Members;</p> <p>Establish a paradigm for future training activities by GEOSS, JCOMM, CEOS and other entities as applicable.</p>	<p>Partial success – some languages (English, Spanish and Portuguese) but timing coincided with Ramadan which made it difficult for Moslems.</p> <p>See below</p> <p>The tenor of the responses to the HPTE questionnaire indicate this was achieved</p> <p>The positive responses to HPTE at WMO Congress points to this as an applicable way of providing training)</p>
<p>Objectives of the HPTE</p> <p><i>Pre-event objectives for the HPTE</i></p> <p>Well publicized through appropriate media circulars and Press Releases;</p> <p>Clearly indicate technical and other requirements in order to allow WMO Members to prepare and organize their staff;</p> <p>Testing all aspects of the HPTE, coordinated by the VLMG, and conduct sufficient test events to allow WMO Members the opportunity to test their capacity to participate and organize their staff;</p> <p>Starts ongoing online training to complement the continuing regional workshops focused on the trainers.</p>	<p>See below</p> <p>See below</p> <p>Partially achieved but could have done better. Letters to PRs from WMO SP, notice on EUMETSAT home page, publicised through the WMO ETR Symposium and various email groups including the Americas Focus Group.</p> <p>Mostly achieved.</p> <p>Achieved for Americas and Asia/Pacific yes but could have done with at least one more test. Europe and Africa needed more training in how to use VISITview and Yahoo/pepphone</p> <p>Achieved for Americas and Brazil has been providing small lessons into FG activities. EUMETSAT has also provided several online lectures. Not achieved for the rest but still early days for this subject.</p>

Event Objectives for the HPTE

Utilize the full VL through all Centres of Excellence and their sponsor(s):

Through testing the ability of the VLMG to plan, implement and deliver a globally coordinated series of training events. These events will occur over a period of several days. The successful completion of the initial HPTE will lead to further events that exercise the full resources of the VL, particularly the VL Notebook functionality.

By providing a focus for VLMG members to develop new learning resources and review existing ones relevant to their local and regional communities;

By providing a focus for VLMG members to engage with their regional communities in the delivery of face to face and online learning opportunities;

To inform WMO Members of the current status and future plans for the space-based component of the Global Observing System with all WMO Members having the opportunity to partake in the HPTE and the lead up events;

To update WMO Members knowledge of the potential applications and use of environmental data from the operational and research and development (R&D) satellites through the provision of a series of coordinated lectures and discussions covering:

- Satellite capabilities (R&D and operational) and use of the Virtual Resource Library;
- Spectral bands and their applications;
- From digital data to satellite data and products;
- Severe Convection and rainfall, as well as other topical areas.

See below

Classroom training for at least 50 people in RA II and RA V through the regular WMO Regional Training Seminars in Nanjing, China, and Melbourne, Australia. Interactive online lectures to WMO Members in each Region through the local WMO Centre of Excellence (Niger, Oman, Kenya, Barbados, Costa Rica, China and Australia).

Achieved. Further regional events planned. No specific plans for activities based around the VL notebooks currently planned.

Partially achieved with some local examples added into HPTE lectures in some Regions (Africa Asia, Middle East and South America)

Achieved

Achieved

Achieved

Anticipated outcomes for the HPTE	See below
VL capacity building:	
Increased awareness and use of the VL;	Achieved as demonstrated in the Brazil evaluation questionnaire
Increased involvement in the VLMG by existing members and further proposals for Centres of Excellence (CoEs) and satellite partnerships;	Partially achieved (existing members) and achieved regarding new members (e.g. CoEs in Oman, Brazil and Argentina).
New regional focus groups instigated;	Partly achieved – Americas FG flourishing, others in the process of being established
Increased activity in the VL from the science groups (IPWG, ITWG, IWWW);	Partly achieved – encouraging signs from IPWG and some exchange with ITWG.
Increased Member participation in regional focus groups;	Increased participation in Caribbean and Americas Focus Group, commencement of European focus groups and in other areas there is expectation of groups forming
Improvements in Education and Training options:	See below
Increased demand and use of collaborative online training sessions;	Response at WMO Cg-XV was overwhelming and PRs want it to occur at least once before the next Congress. Training capacity being lost in face-to-face events can be partially compensated by use of collaborative online learning. Internationalisation of training efforts is helping to conserve knowledge and experience
Provide practical experience in planning, implementing and delivering online training events for WMO Members as well as other groups such as GEOSS, JCOMM and CEOS.	Achieved
Improved utilisation of satellite data and products:	See below
Improvements in the participants use of satellite data and products;	Probably too early to conclude. Look to next biennial questionnaire.
Improvements in the WMO Members knowledge of the use and application of environmental satellite data and products from R&D and operational satellites.	Probably too early to conclude. Look to next biennial questionnaire.

4.2 The group recalled participants' experiences with the HPTE that were included in the reports (see section 2 above). The group reviewed the HPTE through open discussion and concluded on the following **findings, observations** and associated **recommendations**. All recommendations are collected together in Appendix III.

Observation: By any standards the HPTE was a resounding success. Even in difficult circumstances the VL worked together in a very professional manner. WMO Cg-XV recognised the huge positive impact of the event, in particular the fact that it had delivered effective training to over 2,000 participants for more than 120 WMO Member States. This appreciation was placed on record by the many favourable comments from PRs.

Finding: The HPTE delivered more than we said we would and captured a much larger and broader audience (beyond NMHSs) than we had expected. Although this was an indicator of success, it was not anticipated and it points to a need to carefully consider widening the scope of future training activities.

Recommendation: Consider the development of core lectures covering a wider range of applications of satellite data and products ideally aligned to the GEO Societal Benefit Areas (e.g. agriculture, disaster, climate, hydrology, etc).

Recommendation: In light of the association of future events to the GEO SBAs the VLMG should consider establishing links with the GEO Capacity Building Committee.

Finding: It was very difficult to accomplish a truly global training event. We actively engaged most CoEs and satellite operators but found that problems related to time zones, multiple languages and constraints due to local culture inhibited the global nature of the HPTE.

Observation: WMO Congress has requested that we have another HPTE in the next four years (i.e. in the Congress inter-sessional period). A future global HPTE could be achieved by having components defined on a regional basis, using similar material and roughly the same time but not co-ordinated. In other words, the group should think globally and act regionally.

Recommendation: Organise events on a regional basis by CoEs and satellite operators in partnership with events guided by Regional Focus Groups. These could, nevertheless, be coordinated and combined to comprise an event in the global context.

Recommendation: Develop core syllabus early enough to allow regionalization of the course material for each region.

Finding: Many of the participants did not find out about the event via the formal notices and therefore they did not know how and where to register. As a result they could not participate in the practice sessions and did not receive copies of the resource material in a timely fashion. In the PDP the responsibility of informing potential participants and implementing an online registration process was assigned to the WMO Secretariat. However they were unable to meet their commitments due to lack of suitable staffing. Although we reached 120 WMO Members and approximately 2000 people and received numerous plaudits from WMO Congress we do not know how many people or NMHSs missed the event because they were not aware of it.

Recommendation: For all major events we develop, maintain and follow a Project Development Plan (PDP) which addresses resources, activities and timelines. Such a plan should include the advertisement of the event (earlier than we did for the HPTE), ensure an active centralised website for promotion and online registration (online registration and evaluation should be in the WMO official languages to overcome translation problems) and stimulate the active participation of CoEs and Regional Focus Groups in promoting the event.

Recommendation: Each Regional Focus Group should have its own web pages which should include a schedule of Focus Group Meetings with topical areas they might cover. These pages should be linked to the centralised VL web site.

Recommendation: In recognition of the need to plan, coordinate, monitor, manage and promote future activities, along with the maintenance of a centralised VL web site, a full-time VL Support Officer is considered essential.

Recommendation: A central VL web site is established and dynamically maintained by the VL Support Officer to act as a comprehensive focal point for all VL activities.

Finding: There were sometimes difficulties in achieving progress due to the unavailability of individuals and hence emails going unnoticed.

Recommendation: Establish email groups to exchange information about planned events. Such groups should be related to the membership of the Regional Focus Groups.

Finding: The development of the resource material was exceptionally time-consuming.

Recommendation: Have more people actively involved in the development, review and incorporation of local material with the VL Support Officer actively monitoring the progress of the development of materials.

Finding: The lectures were not translated into all WMO languages. This problem was pointed out by EAMAC and it inhibits the utilization for self-directed learning in other forums.

Observation: The core lectures of the HPTE are expected to remain a valuable training resource for many years and limiting their translation to just a few languages will seriously undermine their usefulness in the years to come.

Recommendation: All of the current HPTE lectures should be translated into the six official WMO languages. For future events the lectures should be translated prior to their utilization.

Recommendation: We need to ensure that VISITview lessons have audio and notes for later consolidation and review.

Finding: There were widespread audio problems in terms of connectivity and quality. For example when there were more than 50 participants on Yahoo messenger we experienced problems with drop out and quality. It had been recommended in the PDP that practice sessions would be valuable for the CoEs and participants but this did not occur in all cases. Such practise sessions may have drawn attention to this problem earlier.

Recommendation: When using new or unfamiliar technology, participants need to be competent in using the technology, thus practise sessions should simulate the real event as closely as possible in order to identify potential problems and assure success.

Recommendation: There is a need to develop better audio infrastructure making best use of all available technical solutions.

Finding: The duration of the lectures (90 minutes) inhibited two-way interaction between the lecturer and the participants.

Recommendation: Sessions should be 60 minutes duration or less and leave adequate time for discussion. For future events this may mean there would be sequential lectures on a given topic or theme rather than a single long lecture.

Finding: Participation ran more smoothly where Regional Focus Groups had already been active

Recommendation: VL members to form Regional Focus Groups, where they do not already exist, covering all WMO Regions. All Focus Groups shall be open and all WMO Members are invited to participate in Focus Groups as they see fit. Moreover, all WMO Members should have the opportunity to participate in Focus Groups and this may require training for them to effectively utilise this resource.

Finding: Providing a classroom lecture and an HPTE lecture simultaneously by the same person was extremely difficult using the technology available (fixed microphones, etc). In areas where these were done separately this was not a problem.

Observation: When a formal training event is underway it is advisable to take advantage of the available expertise to provide both face-to-face and online training separately. Remote lectures given in an HPTE format do not have to be given in front of a live audience. Outside lectures into a face-to-face event can also be made to a wider audience, for example by broadcasting the training event using webcam etc. Remote lectures can be given without any formal training event underway.

Recommendation: With current technology (i.e. as used at HPTE) it is not advisable to combine classroom and remote lecture simultaneously by the same person.

Recommendation: Consider the possibility of using webcast of live training events so that many more people can participate. In this way, and using the central VL website schedule of events to advertise the event, we could 'open the training room to the world' and hence deliver widely accessible training in a very cost effective manner.

Finding: It was very valuable for the participants to be able to take home the resource material in a very technologically convenient way. This not only enthused the participants but gave them an invaluable, re-usable and permanent resource for future use.

Observation: Both electronic notebooks and USB hard drives are very valuable. USB hard drives are more robust and last longer, they can be sent back to be updated, and it is easy to copy material to other PCs. On the other hand some developing countries do not have the resources to do the training if the laptops aren't provided to them. There is a continuing risk of the laptop being used for purposes it was not designed for (i.e. it was taken for other uses). Time will change the technology and the underlying thing to focus on is how to enable people to readily get access to the VRL.

Recommendation: Make the resources available in a manner which benefits from latest technology and is appropriate to the target audience.

Recommendation: Keep track of the distributed resources and issue updates when available. This implies the need for the introduction of version control for material and reporting mechanisms to be implemented.

5. REVIEW OF ROLE OF CoEs and SATELLITE OPERATORS (*agenda items 6 & 7 combined*)

5.1 The group reviewed the role of the CoEs and satellite operators as originally defined at VLMG-2. They concluded that a revised set of expectations for all VL partners were now appropriate. The revised expectations are given in Appendix IV.

5.2 The group recognised that some thought needs to be given to a mechanism to give CoEs and satellite operators the opportunity to re-affirm their commitment based on the revised expectations.

ACTION VLMG-3.6: ET-SUP to consider a mechanism to get CoEs and satellite operators to re-affirm their commitment to VL based on the revised expectations.

5.3 In addition to updating the expectations of VL partners the group reviewed the Principles for a VL training event and the example specification of a VL training workstation, both of which were originally defined at VLMG-2. In both cases some minor amendments were agreed. The updated Principles for the VL training event and Sample Specification for a VL Training Workstation are given in Appendices VII and VIII respectively.

6. REVIEW OF VLMG TERMS OF REFERENCE (*agenda item 9*)

6.1 The group reviewed the Terms of Reference (ToR) that were defined at VLMG-2. It was recognised that there was a need to simplify the ToR and to make a clear distinction between the ToR and the goals and objectives.

6.2 The emerging importance of Regional Focus Groups prompted the group to define a role of Focus Group Coordinator and to recognise this role in the ToR. Through his experience with the Caribbean/Americas Focus Group the group asked Tony Mostek to initially fill this role and Tony agreed.

6.3 Through open discussion the ToR were amended and a modified version agreed. The revised Terms of Reference are attached as Appendix V.

7. REVIEW OBJECTIVES OF VLMG (*agenda item 8*)

7.1 The group recalled the objectives it had set for itself at VLMG-2. The group further recalled that one of the goals it set itself at VLMG-2 was to undertake a comprehensive review of the VL after another three years (notionally five years from VL inception).

7.2 Taking note of the explicit actions raised at VLMG-2 and reported in section 2 above, the group had an open discussion of the VL objectives defined at VLMG-2 and agreed that a new set of objectives should be defined. Guided by the Co-Chairs the group formulated a modified set of objectives that reflected the progress since VLMG-2 and the new challenges and growth areas that had been discussed earlier in the meeting. These revised VLMG Objectives are included as Appendix VI.

7.3 Finally the group recognised that a comprehensive review should include an assessment of the VL beyond simply addressing the status of objectives and explicit actions. Guided by the Co-Chairs the group agreed the contents of an Assessment Report. This report is included as Appendix IX and can be summarised as: The broad assessment is the VL has met or surpassed all of its important goals for the 6 year period and in addition outcomes occurred that were not in the 5 year goals set forth at Darmstadt including the HPTE, the formation of focus groups, electronic notebooks and hard drives, the full engagement of ET-SUP. In 2006 there was a major step forward through the engagement of three new CoEs in Oman, Brazil and Argentina. This important advance enabled the VL to reach out both in geographic terms and also in terms of participant languages. These new CoEs are contributing significantly to the VL success. The success of the VL and its activities were well recognised by 15th WMO Congress 2007.

Recommendation for ET-SUP and CGMS: The VL and its Management Group continue as put forth in the evaluation document. Furthermore the value of the activities within the VL, experience with the HPTE and the growing need for training and outreach as requested by Congress point to the need for the development of a position within the WMO SP whose sole role is to support satellite training and VL activities. [Latter point captured also in **Recommendation VLMG-3.7**]

8. SELECTION OF CO-CHAIRS (*agenda item 10*)

8.1 The group were informed that both current Co-Chairs wished to stand down provided replacements could be identified.

8.2 The group considered the subject and after some discussion unanimously agreed that the following VLMG members should be proposed to the VL sponsors as new Co-Chairs in accordance with the VLMG Terms of Reference:

- Dr Volker Gaertner representing a satellite operator (EUMETSAT)
- Dr Luiz Toledo Machado representing a Centre of Excellence (Brazil)

8.3 These proposals will be presented for ratification by the next meetings of ET-SUP and CGMS by the outgoing Co-Chair (Mr Jeff Wilson) and the VL Rapporteur (Dr James Purdom) respectively.

8.4 The group noted that, if the proposals are ratified, then the outgoing Co-Chairs will continue to act in an ex-officio capacity, providing advice and guidance to the new Co-Chairs for as long as it is necessary to ensure a smooth handover.

APPENDIX I

LIST OF PARTICIPANTS

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APPENDIX II

AGENDA

1. Introduction
(including reminder of goals and objectives, reporting arrangements etc)
 2. Review of actions since VLMG-2
(Includes Reports from around the partners, Review of goals and objectives)
 3. Developments in the wider Space and Education community, opportunities and threats for growth and continuity of the VL;
 4. Review of HPTE
 - a. Participation questionnaire - who and how many did we reach?
 - b. Lessons learnt leading up to HPTE
 - c. Did the HPTE deliver what we said it would?
 5. How do we build upon the lessons learnt from HPTE and other VL initiatives since December 2003, including:
 - a. Optimising the use of online learning and collaboration in the traditional Regional Training Seminars
 - b. Should we have other High-Profile-Training-Events, if so how frequently and what geographical coverage
 - c. How do we actively engage all the CoEs and satellite operators in such events?
 - d. Benefits and pitfalls of VL Notebooks and USB Hard drives.
 6. Review of role of CoEs, including assessing regional training needs and capabilities, and forming and running a regional focus group.
 7. Review of role of satellite operator sponsors.
 8. Review of VL ToR and possible modifications; (with respect to the current ToR note the distinction between the Terms of Reference and the Implementation Plan, the latter being subject to regular update.)
 9. Review objectives of the VLMG: Where to from here with the VLMG? (Partners to come with plans and options for implementing their plans; re-affirmation of partners and agreement to roles). How do we deal with non performing VL partners?
 10. Selection of Co-Chairs (as formality to take forward to WMO and CGMS for confirmation);
-

APPENDIX III

SUMMARY OF ACTIONS AND RECOMMENDATIONS RAISED AT VLMG-3

ACTIONS

ACTION VLMG-3.1

WMOSP to update the VL email list to reflect current status of participation.

ACTION VLMG-3.2

The VL rapporteur to CGMS to recommend satellite operators to install an ADDE server.

ACTION VLMG-3.3

The CoE in Niger to investigate the options for coordinating the translation of the four core HPTE lectures into French.

ACTION VLMG-3.4

The VL rapporteur to CGMS to clarify India's participation within the VL.

ACTION VLMG-3.5

CoEs and satellite operators to compare their current activities against the nine GEO SBAs and to report to the VLMG which areas are already addressed and which areas are planned to be addressed.

ACTION VLMG-3.6

ET-SUP to consider a mechanism to get CoEs and satellite operators to re-affirm their commitment to VL based on the revised expectations.

RECOMMENDATIONS [HPTE]

Recommendation VLMG-3.1

Consider the development of core lectures covering a wider range of applications of satellite data and products ideally aligned to the GEO Societal Benefit Areas (e.g. agriculture, disaster, climate, hydrology, etc).

Recommendation VLMG-3.2

In light of the association of future events to the GEO SBAs the VLMG should consider establishing links with the GEO Capacity Building Committee.

Recommendation VLMG-3.3

Organise events on a regional basis by CoEs and satellite operators in partnership with events guided by Regional Focus Groups. These could, nevertheless, be coordinated and combined to comprise an event in the global context.

Recommendation VLMG-3.4

Develop core syllabus early enough to allow regionalization of the course material for each region.

Recommendation VLMG-3.5

For all major events we develop, maintain and follow a Project Development Plan (PDP) which addresses resources, activities and timelines. Such a plan should include the advertisement of the event (earlier than we did for the HPTE), ensure an active centralised website for promotion and online registration (online registration and evaluation should be in the WMO official languages to overcome translation problems) and stimulate the active participation of CoEs and Regional Focus Groups in promoting the event.

Recommendation VLMG-3.6

Each Regional Focus Group should have its own web pages which should include a schedule of Focus Group Meetings with topical areas they might cover. These pages should be linked to the centralised VL web site.

Recommendation VLMG-3.7

In recognition of the need to plan, coordinate, monitor, manage and promote future activities, along with the maintenance of a centralised VL web site, a full-time VL Support Officer is considered essential. Establish such a position within the WMO SP.

Recommendation VLMG-3.8

A central VL web site is established and dynamically maintained by the VL Support Officer to act as a comprehensive focal point for all VL activities.

Recommendation VLMG-3.9

Establish email groups to exchange information about planned events. Such groups should be related to the membership of the Regional Focus Groups.

Recommendation VLMG-3.10

Have more people actively involved in the development, review and incorporation of local material with the VL Support Officer actively monitoring the progress of the development of materials.

Recommendation VLMG-3.11

All of the current HPTE lectures should be translated into the six official WMO languages. For future events the lectures should be translated prior to their utilization.

Recommendation VLMG-3.12

We need to ensure that VV lessons have audio and notes for later consolidation and review.

Recommendation VLMG-3.13

When using new or unfamiliar technology, participants need to be competent in using the technology, thus practise sessions should simulate the real event as closely as possible in order to identify potential problems and assure success.

Recommendation VLMG-3.14

There is a need to develop better audio infrastructure making best use of all available technical solutions.

Recommendation VLMG-3.15

Sessions should be 60 minutes duration or less and leave adequate time for discussion. For future events this may mean there would be sequential lectures on a given topic or theme rather than a single long lecture.

Recommendation VLMG-3.16

VL members to form Regional Focus Groups, where they do not already exist, covering all WMO Regions. All Focus Groups shall be open and all WMO Members are invited to participate in Focus Groups as they see fit. Moreover, all WMO Members should have the opportunity to participate in Focus Groups and this may require training for them to effectively utilise this resource.

Recommendation VLMG-3.17

With current technology (i.e. as used at HPTE) it is not advisable to combine classroom and remote lecture simultaneously by the same person.

Recommendation VLMG-3.18

Consider the possibility of using webcast of live training events so that many more can participate. In this way, and using the central VL website schedule of events to advertise the event, we could

'open the training room to the world' and hence deliver widely accessible training in a very cost effective manner.

Recommendation VLMG-3.19

Make the resources available in a manner which benefits from latest technology and is appropriate to the target audience.

Recommendation VLMG-3.20

Keep track of the distributed resources and issue updates when available. This implies the need for the introduction of version control for material and reporting mechanisms to be implemented.

RECOMMENDATIONS [other]

Recommendation VLMG-3.21: The VL and its Management Group continue as put forth in the evaluation document. Furthermore the value of the activities within the VL, experience with the HPTE and the growing need for training and outreach as requested by Congress point to the need for the development of a position within the WMO SP whose sole role is to support satellite training and VL activities. [Latter point captured also in **Recommendation VLMG-3.7**]

APPENDIX IV

EXPECTATIONS FROM THE CENTRES OF EXCELLENCE, SATELLITE OPERATORS AND WMO/CGMS

Expectations from the Centres of Excellence

Whilst recognizing that each “centre of excellence” has different administrative and financial structures, relationships with the sponsoring satellite operator and links with neighbouring NMHSs, the VLMG recommended the following:

- Nominate a focal point and an alternate within the CoE as the primary contact for all VL business. This person should have some authority to make decisions regarding the use of the VL within the CoE;
- Run international training events that conform with the VL guides for organising and running training events;
- Develop and run regular (at least monthly) weather discussions (and also possibly discussions covering other GEO SBA topics) for Regional Focus Groups
- Maintain an up to date list of priority training needs for that region:
 - Links to ET-SUP for coordination;
- Develop and maintain proficiency in providing online training using tools such as VISITView;
- Maintain regular contact with the other members of the VL Management Group:
 - Co-chair responsibility to coordinate sessions;
- Provide the Co-Chairs (or designated people) a brief annual report at the end of August each year, relevant to the VL, outlining the training activities for the past 12 months, anticipated training activities for the next twelve months, priority training needs for the region for the next 12 months and their ability to meet the training needs, and other information they feel is relevant to the VL:
 - Co-chairs responsibilities to report to constituent bodies after receipt of information.

Expectations from the satellite operators

- Nominate a focal point and alternate for VL business. This person should have some authority to make decisions about VL matters within the satellite operator and some delegation to assist the CoEs on a case by case basis;
- Make near real-time data, products and/or selected case study data available for education and training purposes to CoE’s in the correct data formats for use with the agreed VL tool sets;
- Assist the CoE with the regular weather discussions (and also possibly discussions covering other GEO SBA topics) with the Regional Focus Group
- Maintain regular contact with the CoE(s) that the satellite operator is sponsoring, focusing in particular, but not solely on communications and data access issues. As appropriate, provide an alerting role for the CoE(s) on new training resources and material generated within or for the satellite operator;
- Maintain regular contact with the other VL satellite operators on data access and format issues and other matters as appropriate;
- Provide the Co-Chairs (or designated people) a brief annual report at the end of August each year, relevant to the VL, outlining the activities that the satellite operator has undertaken in the past 12 months for their sponsored CoE(s) and the VL in general, and plans relevant to the CoE and the VL for the next 12 months;
- Assist the CoE(s) to overcome resource constraints on VL related matters through advice, championing with other funding bodies and direct assistance as appropriate.

Expectations from WMO and CGMS

- Provide long term guidance and advice, and where appropriate, direction regarding global and regional priorities;
- Represent the VL partners at appropriate policy and resource fora;
- Assist with resource issues.

APPENDIX V

TERMS OF REFERENCE FOR WMO/CGMS VIRTUAL LABORATORY MANAGEMENT GROUP (VLMG)

The Virtual Laboratory Management Group (VLMG) is responsible for the direction and evolution of the VL. It reports to the VL Sponsors through the WMO CBS OPAG/IOS/ET-SUP and the CGMS VL Rapporteur respectively.

The VLMG shall ensure that the following VL Strategic Goals are met:

- To provide high quality and up-to-date training resources on current and future meteorological and other environmental satellite systems, data, products and applications;
- To foster the use of satellite data and products by conducting classroom and online training sessions as well as regular weather discussions primarily for NMHS staff on a regional basis;
- To enable the “centres of excellence” to facilitate and foster research and the development on the use of satellite data for societal benefit applications at the local level by NMHSs and other organisations through the provision of effective training, resource materials, including links to relevant CGMS science groups.

The VLMG shall provide an effective Management structure for the VL and shall be comprised of:

- Two Co-chairs, being one satellite operator and one representative from the “centres of excellence” ;
 - Secretariat from WMO Space Programme Office;
 - Representatives from all remaining sponsoring satellite operators and “centres of excellence”;
- Membership may also include:
- Representatives of CGMS science teams as appropriate;
 - Other interested parties as deemed appropriate by the Co-Chairs.

One member of the VLMG shall be appointed as Focus Group Coordinator who shall be responsible for:

- Providing help and advice on the establishment of new Regional Focus Groups;
- Providing help and advice on the activities of established Regional Focus Groups;
- Promoting and facilitating interaction between Regional Focus Groups.

The VLMG shall conduct the following activities:

- Work with the WMO Space Programme and CGMS Satellite Operators to ensure that the VL Strategic Goals are accomplished;
- Formally review the VL and update the implementation plan every five years;
- Every year produce an Annual Report related to the Strategic Goals and make recommendations for consideration by the sponsors;
- Meet at the five-year planning cycle and at least once within the five-year cycle, as appropriate;
- Recommend VLMG Co-Chairs to the VL Sponsors when appropriate⁽¹⁾.

⁽¹⁾ Selection of Co-Chairs. The selection of Co-Chairs is the responsibility of CGMS, for the satellite operators, and by the WMO OPAG/IOS/ET-SUP, for the Centres of Excellence. These bodies will consider proposals for the position of Co-Chairs at their first meeting following the VLMG meeting. Outgoing Co-Chairs will serve in an ex-officio capacity. The Co-Chairs will not come from the same VL partnership.

APPENDIX VI

OBJECTIVES OF VLMG

Over the next five years the main activities of the VL will embrace the following ideas:

1. To increase our emphasis on remote training.
2. To expand our focus into the GEO Societal Benefit Areas.
3. To be globally active through our Regional Focus Groups (RFG) by:
 - a. Conducting ongoing training in the use of satellite data and products in the regular sessions of the RFG;
 - b. Instituting regional HPTEs that incorporate classroom and online sessions;
 - c. Co-ordinating RFG activity.
4. To exploit the full complement of satellite data and products from current operational and R&D satellites in order to:
 - a. Provide a richer set of satellite data and products for today's users;
 - b. Prepare users for the next generation of operational satellites.
5. To contribute to the development of training materials and resources.

VL Continuing Goal

- (1) To maintain a baseline VL and to foster its logical growth.

VL Connectivity

- (1) To assure links between the "centres of excellence" (and supporting satellite operators) with a minimum data rate of 1 Mbs, to support communication (email, voice), the exchange of software and limited image data sets (e.g., case studies and some near real-time data sets);
- (2) "Centres of excellence" to consider means to increase link capacity over the next 5 years;

Virtual Resource Library (VRL)

- (1) To maintain and update a selection of training resources (includes image data sets, s/w, tools);
- (2) To maintain a structure for the depository of training resources which will allow easy access by the "centres of excellence" trainers;
- (3) To provide ready and easy access to all relevant users;
- (4) To consider the provision of additional (enhanced) material to address satellite related training materials for the GEO Societal Benefit Areas.

VL Utilization

- (1) To maintain and enhance (such as adoption of a learning management system) VL user tracking and feed-back mechanism;
- (2) To keep abreast of user requirements for the VL with the baseline being WMO Pub No. 258, but also relying on feedback from the WMO SP questionnaire and regional focus group input.;
- (3) To provide a mechanism for training meteorological students to an operational level of expertise.
- (4) Allow for the use of daily weather discussions during training events based around near real-time data.
- (5) Near real-time data are needed to train forecasters on the effective use of new satellite reception and processing systems. Depending on the application, the need for near real-time data availability may not be as stringent.

APPENDIX VII

PRINCIPLES FOR RUNNING VL TRAINING EVENTS

Guide for running VL training events

The VL Management Group agreed to the following principles for the planning and running of VL training workshops:

- Planning should begin a year prior to the event;
- All the course information must be included in a Learning and Action guide that conforms with the VL template:
 - This acts to focus the participants and lecturers on the purpose of the training activity and its relationship to the course objectives and other learning activities;
- Courses should include a wide range of learning activities. Those activities are designed to engage participants taking into account their culture, language and skill level:
 - Typical activities will include traditional face to face content lectures and their accompanying consolidation workshops, online lectures, talks in non formal sessions, group discussions, poster presentations, participant presentations on how they utilise satellite data and products, real-time imagery discussion and one on one sessions with lecturers. The course must cover the three facets of learning: skills, knowledge and attitude;
- Must provide resource material for participants to take back to their home institution to assist them in providing training at their NMHS;
- Should form a Regional Focus Group composed of the training participants, the appropriate satellite operator and the “centres of excellence” to become a self help team;
 - In some instances this will be accomplished by the participants joining an ongoing Regional Focus Group.
- Should conduct a six month assessment after the training workshop and if necessary provide follow-up online training covering relevant workshop material;
- Should report back to the other “centres of excellence” on lessons learnt from running this training event to aid in the running of future training events.

Possible measures to evaluate VL effectiveness

- How many students have been trained as participants of training events;
 - How many distance hours / lessons;
- From the six month assessment following the training workshop evaluate the impact of the learning on the ability of the students to better utilise satellite data and products;
- How many NHMS staff have been formally trained by the participants following their participation in a VL training event;
- What impact have the NHMS advised us of as a result of their staff attending VL training events;
- Tracking changes in utilization of sat data and products by WMO Members using the Questionnaire.

APPENDIX VIII

A SAMPLE SPECIFICATION FOR A VIRTUAL LABORATORY TRAINING WORKSTATION

The workstation should have the following hardware

- Sound card
- DVD/CD reader and writer
- Network card
- Wireless or Bluetooth connection
- Modem
- Appropriate memory and hard disk capacity
- Microphone and headset
- USB memory stick

Non VL Applications

- Anti virus software
- Firewall
- Browser
- Powerpoint or openoffice
- Web editor
- Software to handle audio hook ups (i.e., yahoo messenger, msn messenger, netmeeting, Skype ...)
- Picture editing software (Paintshop pro or similar)
- CD/DVD burner software
- ftp programme

VL Applications

- RAMSDIS
- SATAID
- VISITView
- AniS (for web animations and control - ssec)
- QUIZIMAGE (online questions and discovery tool for images- ssec)
- Hydra, the multispectral tool from CIMSS
- Envi freelook
- New EUMETSAT CAL tools
- The UNIDATA Integrated Data Viewer (IDV)
- McIDAS

Virtual Resource Library “titles”

- The CIRA 3.9 and GOES tutorials
- The EUMETSAT MSG interpretation guide
- HPTE core lectures and notes
- COMET satellite training material
- Training Course lecture and resource material
 - PPT
 - Pictures and movies
 - Learning guide
 - Written document
- Learning Guide template and course learning guide
- Current set of “essential” satellite related URLs
 - Links to products
 - Algorithms
 - Tutorials
- Syllabus for selected events

Digital data

- Selection of canned McIDAS data and workshop notes for that data
 - GOES
 - MSG
 - MT-SAT
 - FY-X
 - AVHRR
 - MODIS
- Selection of canned SATAID data and workshop notes for its use
- Selection of VISITView lessons

Digital Manuals

- RAMSDIS users manual
- SATAID users manual
- VISITView user guide
- AniS user guide
- Quizimage user guide
- User manual for EUMETSAT CAL tools
- IDV user guide
- Guide on the use of Hydra

APPENDIX IX

VLMG-3 ASSESSMENT OF THE VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY

The resource library, its role, how it is structured, how it is “peer reviewed”, and other pertinent matters;

The Virtual Resource Library (VRL) has continued to develop. EUMETSAT, CIRA, JMA and BMTC have updated and extended their sites and a new site has been added at CPTEC. For purely practical reasons it has not been possible to centrally peer review all of the VRL material and thus it is the responsibility of the owner of website to ensure that the material is peer reviewed and this has been done.

VISITview, its role within the Virtual Laboratory construct, etc;

VISITview continues to be at the core of the collaborative online learning for events such as the High Profile Training Event (HPTE), the Regional Focus Group Weather discussions and the occasional sessions provided by CIRA and EUMETSAT. VISITview was extended for the HPTE and further development to support non English sessions will occur in the near future. In summary VISITview has been extremely successful and was the keystone of HPTE success.

Most of the VRL software tools (RAMSDIS, RAMSDIS online, McIDAS, SATAID) continue to be heavily utilised, new tools such as Hydra have been added and some tools such as Envi Freelook removed.

Expectations for the RMTCs that are participating in the Virtual Laboratory specially in the area of a review of the questionnaire to help focus their training, and as an input to WMO;

The CoE's continued to assist ET-SUP with the Biennial Questionnaire through providing their own input and through their Regional Focus Groups and regional networks improving the return rate of Questionnaires from WMO Members. This was particularly evident in RA III and RA IV where the majority of WMO Members returned Questionnaires following encouragement of the CoE's in Costa Rica and Barbados. ET-SUP continue to be responsible for the development and analysis of the Questionnaire with the CoE's able to assist with improving the return rates. Copies of the Technical Document containing the analysis of the Questionnaire are provided to each CoE to assist in determining the training needs analysis for the WMO Members in their area.

Coordination of training activities that could lead to a schedule of “classes” each year;

Since the Dec 2003 Satellite Training Seminar in Barbados there have been regular (at least monthly) Weather discussions held in the Caribbean and Americas. This group is now so active that additional online meetings are called by the group on occasion of severe weather to deal with operational matters. These discussions are held in Spanish and English.

The HPTE provided a core schedule of classes across the globe in the October and November 2006. In most regions these core lectures were supplemented by additional local lectures and/or weather discussions.

EUMETSAT, CIRA and CPTEC have all provided lectures to WMO Members in their area with some WMO Members in the Asia Pacific area participating in the EUMETSAT lectures.

Virtual Laboratory participant roles and responsibilities;

All CoE's have been active in VL activities through either face-to-face training and/or online training but there could be more involvement by some of the sponsors. The expectations of the VL participants were clearly outlined at the second VL Management Group meeting in Barbados and are being met on a best effort basis. The learning that had occurred during the first six years of the VL Management Group, in particular the VL Regional Focus Groups and the HPTE had helped define exciting new pathways forward as well as further elaborating activities that a VL participant

should undertake. As the goals for the next period are agreed the association of activities with their responsible VL participant shall be embodied in the plan.

Archiving of training class presentations as a future training resource;

Classroom material from the face-to-face training events in Nanjing (2000), APSATS (2002), Barbados (2003), Costa Rica (2005) and Nanjing and APSATS (2006) have all contributed to the VRL. This material has been supplemented by additional lectures and resource material from groups such as CIRA, EUMETSAT, CIMSS, COMET and ASMET to create a rich body of resources and training material in a variety of WMO languages. The recent HPTE built on this material and extended it by including audio versions of the HPTE lectures in three languages (English, Spanish and Portuguese). The electronic note books and USB hard drives now contain more than 35 GB of teaching and training resources, data and software tools for use by VL partners and end users.

Development of a web-based training resource available to WMO, how it is managed, and what is the corresponding role of the Centre of Excellence

As noted in the summary assessment from the second VLMG meeting in Barbados this goal has been easily met through the use of VISITview and the library of VISITview lessons available via the VRL.

Summary Assessment

Broad assessment is the VL has met or surpassed all of its important goals for the 6 year period and in addition outcomes occurred that were not in the 5 year goals set forth at Darmstadt including the HPTE, the formation of focus groups ,electronic notebooks and hard drives, the full engagement of ET-SUP. In 2006 there was a major step forward through the engagement of three new CoEs in Oman, Brazil and Argentina. This important advance enabled the VL to reach out both in geographic terms and also in terms of participant languages. The success of the VL and its activities were well recognised by WMO 15th Congress 2007.

Recommendation for ET-SUP and CGMS: The VL and its Management Group continue as put forth in the evaluation document. Furthermore the value of the activities within the VL, experience with the HPTE and the growing need for training and outreach as requested by Congress point to the need for the development of a position within the WMO SP whose sole role is to support satellite training and VL activities.