

<b>WMO Space Programme</b>	<b>FIVE-YEAR STRATEGY FOR THE CGMS VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY</b>	SAT-VL_STR Version 2 15/04/2009
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*This strategy was proposed by the Virtual Laboratory Management Group, endorsed by the Coordination Group for Meteorological Satellites (CGMS) at its 36th session and by the WMO Commission for Basic Systems at its 14<sup>th</sup> session (CBS-XIV).*

## **1. INTRODUCTION**

### **1.1 Scope and definition**

The CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VL) was established to help improve the world wide utilization of satellite data and products by WMO Members.

The VL is a global network of specialized training centres, named “Centres of Excellence in Satellite Meteorology (CoE)”, that are supported by one or more CGMS satellite operators. These CoE, often co-located with WMO Regional Training Centres (RTC), are established in the various WMO Regions to meet user needs for increased skills and knowledge in using satellite data within their Region. Each CoE is responsible for conducting training activities and normally supports one or more Regional Focus Groups involving NMHSs from its region.

### **1.2 High-level goals**

Current top-level goals of the VL are:

- i) To provide high quality and up-to-date training and supporting resources on current and future meteorological and other environmental satellite systems, data, products and applications;
- ii) To enable the Centres of Excellence to facilitate and foster research and the development of socio-economic applications at the local level by the NMHS through the provision of effective training and links to relevant science groups.

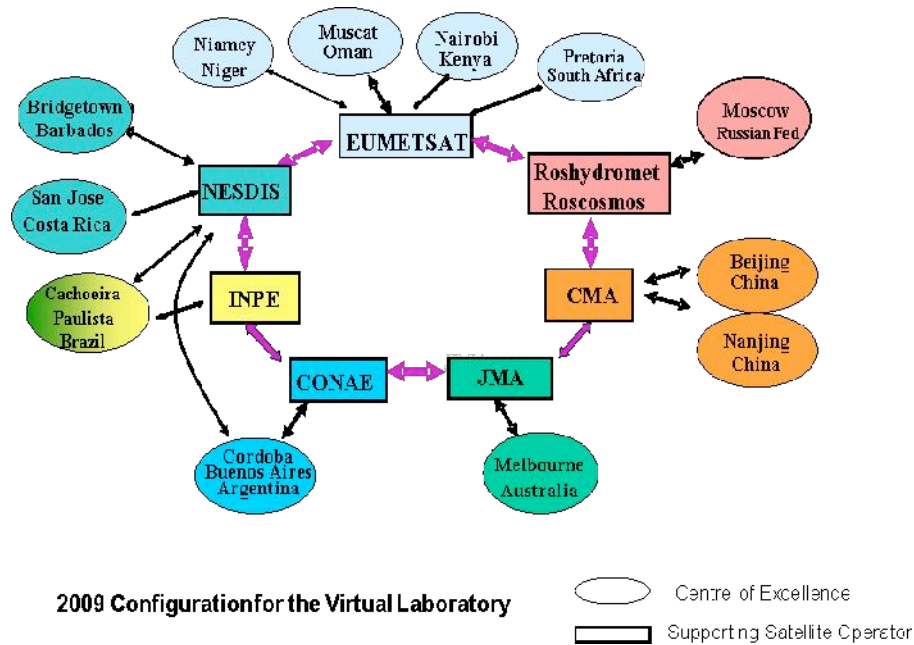
The VL activity aims at achieving these top-level goals through providing access to:

- Case study material and near real time data,
- Training and educational resources, and
- Software and expertise on how to best utilize satellite data and products.

### **1.3 Current status**

In 2008, the VL was a collaboration between CMA, EUMETSAT, INPE, JMA and NOAA, as concerns the satellite operators; and nine CoEs that were located in Argentina, Australia, Barbados, Brazil, China, Costa Rica, Kenya, Niger, and Oman.

The figure below shows the various linkages within the VL between CoEs and their supporting satellite operators in April 2009. The continuing growth in the VL community is seen with the recent additions of INPE/CPTEC in Brazil; CMATC in Beijing, China; SAWS in South Africa; CONAE, SMN and UBA in Argentina, Roshydromet in the Russian Federation.



#### 1.4 Evolving user needs

In the coming years there will be significant changes in the user community requiring training, the way teaching and learning is carried out and the subject matter of the training. There will be significant advances in e-learning technology and increased availability of high speed low cost communications across the globe. Increased satellite capabilities will lead to new data and product application areas, over and above the traditional weather forecasting, which will become increasingly important. For example, the ability to measure precisely and understand climate change and its impact is now a global priority.

As more NMHSs take advantage of automated services, weather forecasters will require regular training to provide an expanded set of products that meet the needs of a wider range of users including for instance environmental scientists, software engineers and developers of new user-driven services. It is clear that with new satellite technologies, advanced training will become an imperative to ensure full utilization of this valuable resource.

#### 1.5 New strategy

Building upon the experiences and successes of the VL over recent years, and taking into account the evolving user needs, this document presents a five-year strategy for the VL. It is complemented by a plan for implementing this strategy.

### 2. STRATEGIC OBJECTIVES FOR THE VL

#### 2.1 Target users

The VL will aim at providing training and training resources for NMHS staff, noting that this includes a diversity of profiles from core synoptic weather forecasting to a wide range of applications to related fields, as the activity of NMHSs tends to expand.

#### 2.2 Training areas

First of all, the VL will provide training that exploits the full potential of satellite data and products from both operational **and** several R&D satellites and, in so doing, prepare the various user communities

for the next generation of space-borne Earth observing systems.

Secondly, and bearing in mind the ongoing establishment of various elements of the GEOSS and the emphasis now being placed upon GEO capacity building efforts, especially for the developing countries, VL training activities may in the future consider the training needs of some other GEO Societal Benefit Areas in addition to Weather and Climate: Agriculture, Biodiversity, [Disasters](#), Ecosystems, [Energy](#), Health and [Water](#).

The training programmes of the CoEs and satellite operators comply with the principles and recommendations described in the satellite meteorology component of WMO publication 258 "Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology". This document places major emphasis on the training of trainers and sets the standard for competence training. Therefore, VL training activities will have to closely follow any evolution in WMO publication No. 258 to meet new training needs.

Building upon the currently available expertise within the VL network, training activities should first focus upon the following topics:

- (i) Satellite Remote Sensing
  - Satellite capabilities
  - Spectral bands and their applications
  - Cloud analysis and image interpretation
  - Microwave applications
  - Products – Precipitation, Winds, Soundings, etc.
  - Resolution, calibration, product quality
- (ii) Meteorology
  - Severe convective systems
  - Heavy rain and floods
  - Winter storms
  - Tropical storms
  - Impact on transportation (land, aviation, water, space, etc.)
- (iii) Climate
  - Inter-calibration issues
  - Radiation budget
  - Ocean and cryosphere
  - Aerosols and ozone
- (iv) Hydrometeorological and other natural disasters
  - Fire, wind, etc.

Where satellite observations are of benefit, and there is a user requirement, then the focus of VL activities could be widened to support training related to:

- (v) Ocean applications
- (vi) Land applications
- (vii) Hydrology and water management
- (viii) Atmospheric chemistry, air quality
- (ix) Environmental quality

Applications and Service-based training will increasingly involve the use of satellite data *in combination* with other data sets such as weather radar, NWP, lightning, precipitation, land information, etc., and may well be carried out in partnership with other Institutes where the relevant expertise exists.

### 2.3 The Virtual Resource Library

The Virtual Resource Library (VRL) is a key asset of the VL. A key goal is to ensure that this valuable repository of training resources is secured, maintained and configured in such a way that effectively

supports both the contribution and use of resources. To this end, it is proposed that the VRL should be accessible through a centralized Web portal. The host of such a portal must have experience in maintaining and managing such a system. Examples of such sites might be the Environmental Satellite Resource Centre (ESRC) hosted by COMET and the CEOS Educational Resources Portal maintained by EUMETSAT.

## 2.4 Role of the CoE

Each CoE is responsible for conducting international training activities, in one or more WMO working languages, for the benefit of NMHSs from its Region, along the lines of the Virtual Laboratory.

For that purpose, and considering the expanding training needs within the regions, the CoE is expected to survey and maintain a list of training requirements for its Region, to organize and run training events, to develop and maintain proficiency in providing online training using tools such as VISITView, and to establish and support one or more Regional Focus Groups holding regular online sessions.

The CoE, through a nominated focal point and an alternate, will maintain coordination with the VL Management Group and provide the Co-chairs with a brief annual report outlining the relevant past training activities, the priority training needs for the region, their plans to meet these needs in the coming twelve months, their overall situation and other information as appropriate.

## 2.5 Regional Focus Groups

For the VL to realize its potential and become a global provider of training, each CoE will need to establish and/or strengthen the Regional Focus Groups (RFG).

The RFG is a virtual meeting that is convened by the CoE on a regular basis through online sessions, using VisitView or equivalent tools, in order to maintain an active sharing of experience and know-how within the Region in between training events. The primary scope of RFG sessions can be to hold weather briefings. It also allows highlighting significant recent situations to keep abreast of new developments, and to ask and answer questions. Through this mechanism, the CoEs play an important networking role and help build a strong community of practice.

## 2.6 Tools and techniques

A key component of the advanced training will be greater use of blended learning, a training concept successfully implemented in recent years by a number of training centres. Blended learning combines online and traditional methods for training and is a very cost effective means of expanding the access to training materials while preserving many of the benefits of traditional training approaches. Its wider use should be regarded as a key goal of the VL. Conferencing and audio/video-supported training tools are now emerging and these developments will be assessed and incorporated by VL partners in their training programmes, as appropriate.

The course management system, [Moodle](#), and distance learning tools like CENTRA are being adopted among the VL partners. The progression to new “tools” for use by trainers is important to the growth of the VL.

The quality of Internet connectivity is very important to support the use of video, voice and other high quality training tools in the VL environment. To provide effective training, CoEs need to have an Internet connection with a *minimum* data rate of 1 Mbs *specifically dedicated* to CoE training activities. Such a data rate is the absolute minimum needed. Status of Internet connection needs to be included in the CoE annual reports to VLMG every September.

## 2.7 Feedback mechanism

Increasingly, it is necessary to demonstrate the tangible benefits coming from human and financial resource investments in training. In particular, how training leads to an improvement in services

provided by the NHMS. The VL will develop systematic feedback and reporting mechanisms that will lead to continuous improvement ensuring that this key objective is met.

## **2.8 Outreach**

Past enquiries indicate that many users are not yet fully aware of the resources that the VL can provide. Information actions shall be considered to raise the awareness of WMO Members through the VL website; and at the regional level through the Centres of Excellence, the WMO Regional Associations and the Regional Rapporteurs for the Space Programme.

## **3. SECURING AND ENHANCING THE VL NETWORK**

To implement the VL strategy in the coming years, the following three fundamentals of the VL have to be fully supported by the partners:

- ❖ Commitment = by all the partners to put effort and resources into the VL;
- ❖ Cooperation = building relationships, e.g. via the set up of Regional Focus Groups;
- ❖ Collaboration = jointly developing, delivering and exchanging training resources.

### **3.1 Commitment**

As noted earlier, the long term effectiveness of the VL relies on the long-term commitment of the CoEs and the satellite operators to meet training requirements coming from their various user communities. In turn, the effectiveness and success of the CoEs is highly dependent on five factors; the support from their sponsoring satellite operator, the support from local management, the availability of trained personnel, the quality of the training technical infrastructure, and political stability.

### **3.2 Expansion of CoEs**

While the VL has existed for less than a decade, both its growth and positive impact have been dramatic. This was recognized by the WMO Congress. We expect the growth of the VL to continue with sponsorship from additional satellite agencies and inclusion of more CoEs. This growth should ensure that all countries in a particular Region can benefit from VL training activities and that training can be provided in all WMO official languages. These additional CoEs will facilitate intercontinental cooperation in training and the development and exchange of training resources in additional languages, as well as provide a risk reduction measure should a nearby CoE need assistance.

### **3.3 Partnership**

The Eumetcal Project of EUMETNET is addressing the meteorological training needs of much of WMO Region VI (RA VI). It is reasonable to consider that the VL network could take advantage of Eumetcal satellite related training activities in RA VI. The expansion of the VL network in this manner will be carried out in partnership with established European Training Centres and others in RA VI such as Russia with its WMO Training Centres in Moscow and St. Petersburg.

### **3.4 Coordination**

Taking into account the dynamic expansion of the VL in terms of new CoEs, future Regional Focus Groups, wider scope of applications covered, and larger audiences, there is a clear need for strong project coordination. Given the decentralized nature of the VL, this can only be efficiently achieved if coordination is ensured by a dedicated person assigned to this function.

## **4. IMPLEMENTATION PLAN**

An Implementation Plan should be developed for the five-year period and include tasks, actions, responsibilities, deadline and deliverables, directly related to the strategic goals mentioned above. Progress in the implementation should be monitored on a yearly basis by the Virtual Laboratory Management Group (VLMG) and the Plan updated as appropriate.