

RA V (South-West Pacific) Survey Report

on

Institutional Arrangements, Challenges and Priorities

World Meteorological Organization

April 2014

Table of Contents

Executive Summary	ii
1 Introduction.....	- 1 -
1.1 Composition of RA V.....	- 1 -
1.2 Organization of Survey Questionnaire	- 2 -
2 Institutional Arrangements.....	- 2 -
2.1 Institutional Arrangements.....	- 3 -
2.2 Functional Scope	- 4 -
2.3 Legislative Arrangements	- 5 -
2.4 Other Regulatory Frameworks.....	- 7 -
3 Management and Organization	- 9 -
3.1 Human Resources.....	- 9 -
3.2 Budgetary Provision in Year 2013-2014	- 11 -
3.3 Operational Scope	- 12 -
3.4 Business Model	- 12 -
3.5 NMHS Quality Management Programme	- 13 -
3.6 Development/Strategic Plan for Next 3- 5 Years.....	- 13 -
4 Operations and Services.....	- 15 -
4.1 Types of Services Provided.....	- 15 -
4.2 Current Level of Service Provisions.....	- 15 -
4.3 Adequacy of Monitoring Infrastructure.....	- 17 -
4.4 Forecasting Capacity and Early Warning System (EWS)	- 18 -
5 Challenges and Priorities for RA V	- 19 -
5.1 Challenges.....	- 19 -
5.2 Future Priorities.....	- 20 -
5.3 Subsidiary Bodies.....	- 21 -
5.4 Supports from Members and Secretariat	- 23 -
6 Expected Outcomes from the 16th Session of RA V	- 24 -

Executive Summary

The Members of WMO Regional Association V (RA V) have been surveyed in order to gather information on the institutional arrangements for the national provision of hydrometeorological services and to identify the most important challenges and priorities of Members and of the Regional Association as a whole. The Survey was prepared by the RA V Task Team on Strategic and Operating Planning (TT-SOP) which reports to the RA V Management Group. The data obtained from the Survey will help the RA V Management Group and WMO Secretariat prepare baseline information and background material, including the identification of regional priorities, in order to inform and support evidence-based strategic planning discussions at the forthcoming sixteenth session of RA V.

The Survey was conducted on-line using the SurveyMonkey platform during the period January–February 2014. Nineteen out of possible 23 responses were received.

Institutional Arrangements

NMHSs in RA V are most commonly entitled “Service” or “Agency” and work under a variety of different kinds of parent organization, including ministries, departments and office of president, and with different degrees of autonomy. Two third of Members are functioning under one or more legislative acts or orders of decree; one third of Members are functioning without legal meteorological authorities or on an *ad hoc* basis.

Management and Organization

Most NMHSs in RA V are government or state-owned agencies operating within national Government policies and frameworks with, in most cases, little scope for commercial activities. All but one NMHS have development/strategic plans in place covering the next 3-5 years. Capacity building of staff, enhanced operational services and improved IT services are the most commonly identified priorities of these plans.

Operations and Services

NMHSs in RA V deliver a broad range of services across many sectors. Public weather forecasts and warnings and aviation services are provided by all and most also provide climate and marine services. Tailored services to specific users are commonly also provided along with agro-meteorological services. Only a small number of NMHSs have responsibility for hydrological services and geophysical services such as volcanoes or earthquakes. The primary challenges in delivering these services to an adequate level are insufficiency of staffing resources and shortcomings in the underpinning observations and IT infrastructure.

Challenges and Priorities

The challenges in the Region identified by the Survey include lack of qualified personnel, NWP modeling capacity, gaps in the observing system and the inadequacy of early warning services for DRR.

Serious	Moderate to Serious
<ul style="list-style-type: none"> • Adequacy of NWP Modeling Capacity • Lack of qualified personnel in some areas • Adequacy of EWS services for DRR 	<ul style="list-style-type: none"> • Adequacy of telecommunication facilities and capacity • Adequacy of existing observing systems • Data policies
Moderate	Slight
<ul style="list-style-type: none"> • Adequacy of climate services • Improved visibility towards the decision makers • Anticipated Budget Cuts 	<ul style="list-style-type: none"> • Relationship with private sector • Anticipated Staff Cuts • Introduction/maintenance of QMS

The Survey identified 6 regional priority areas for continued attention:

- WIGOS/WIS
- Capacity Building
- Enhancement of Services – PWS, DRR/EWS and Aviation
- Strengthening of Climate Services including GFCS
- Improvement of Quality Management System (QMS)
- Cooperation and Partnerships

Financial and staffing constraints are one of the main challenges that limit the ability of many Members to participate in regional activities and working bodies.

Members look to support from other Members in the form of joint/twinning projects, capacity building, technical support on QMS and infrastructure support, and to the WMO Secretariat for coordination support for participation in regional events, strategic planning and sharing information on regional activities.

Expected Outcomes from RA V-16

During the forthcoming RA V-16, Members wish to discuss existing economic constraints, data policy, the relationship between private and public sectors, and to determine clear priorities for the next intersessional period and agree on concrete actions to address these.

Expected outcomes from RA V-16 include strengthening of regional cooperation and the preparation of an agreed strategic plan to guide the work of RA V for the next 4 years, including a clear articulation of a small number of high priority work areas. Progress towards improved regional observing systems and minimization of the extent of missing data is also sought.

Lists of Figures:

Figure 1.1: Sub-regional group of Members.....	- 1 -
Figure 2.1: Provision of aeronautical meteorological services.....	- 5 -
Figure 2.2: Legal instrument for meteorology.....	- 6 -
Figure 3.1: Number of staff in NMHSs.....	- 9 -
Figure 3.2: Trends of staff numbers in recent 3-5 years.....	- 11 -
Figure 3.3: Business model of NMHSs.....	- 13 -
Figure 4.1: Current level of service provisions.....	- 16 -
Figure 4.2: Level of research capabilities and development areas.....	- 16 -
Figure 4.3: Inadequacy of equipment and infrastructure.....	- 17 -
Figure 4.4: Forecasting capacity of NMHSs.....	- 18 -
Figure 5.1: Challenges of NMHSs.....	- 19 -
Figure 5.2: Support to subsidiary bodies.....	- 21 -
Figure 5.3: Reason for not supporting subsidiary bodies.....	- 21 -
Figure 5.4: Useful activities of subsidiary bodies.....	- 22 -

List of Tables

Table 1.1: Regional Members by Sub-Group and WMO accession date.....	- 1 -
Table 2.1: Formal title of NMHSs and their parent organization	- 3 -
Table 2.2: Institutions responsible for hydrological services	- 4 -
Table 2.3: Primary legislation that determines the functions of NMHS	- 6 -
Table 2.4: Additional regulatory frameworks of NMHSs	- 7 -
Table 3.1: Qualification and average age of staffing	- 10 -
Table 3.2: Budget of NMHS for recent fiscal year	- 11 -
Table 3.3: Operational services provided by NMHS	- 12 -
Table 3.4: Priority areas of Development/Strategic Plan	- 14 -
Table 4.1: Type of services provided by NMHSs	- 15 -
Table 4.2: Areas of equipment and infrastructure inadequacy	- 17 -
Table 5.1: Challenges at different levels.....	- 20 -
Table 5.2: Priorities of WMO SOP, RA V SOP and survey	- 21 -
Table 5.3: Number of respondents by outcome and level of usefulness	- 22 -

1 Introduction

The Members of WMO Regional Association V (RA V) have been surveyed in order to gather information on the institutional arrangements for the national provision of hydrometeorological services and to identify the most important challenges and priorities of Members and of the Regional Association as a whole. The Survey was prepared by the RA V Task Team on Strategic and Operating Planning (TT-SOP) which reports to the RA V Management Group. The data obtained from the Survey will help the RA V Management Group and WMO Secretariat prepare baseline information and background material, including the identification of regional priorities, in order to inform and support evidence-based strategic planning discussions at the forthcoming sixteenth session of RA V.

The Survey was conducted on-line using the SurveyMonkey platform during the period January –February 2014. Nineteen out of a possible 23 responses were received³.

1.1 Composition of RA V

Regional Association V is composed of 23 Member countries and territories in South-East Asia and the South-West Pacific. Based on geographic location and development status, the Members of RA V can be assigned to three sub-groups: South-East Asia (SEA) (6 Members), Pacific Island Countries and Territories (PICT) (13 Members) and other (Other) advanced countries (4 Members). According to the WMO Membership record, New Zealand was the first country in RA V to take WMO membership whilst Tuvalu is the most recent. Details are given in Figure 1.1 and Table 1.1.

Figure 1.1: Sub-regional group of Members

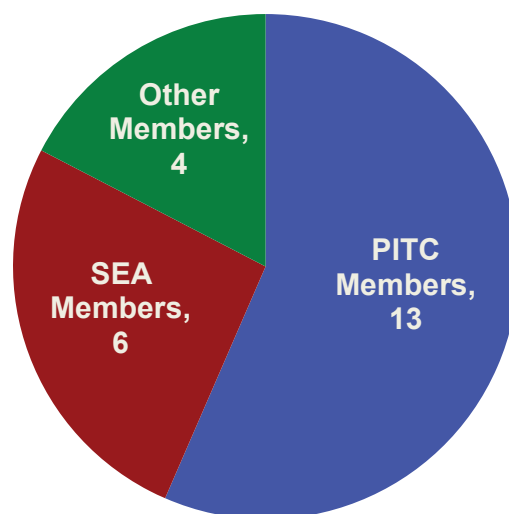


Table 1.1: Regional Members by Sub-Group and WMO accession date

³ The following Members responded to the Survey: Australia, Brunei Darussalam, Cook Islands, Fiji, French Polynesia, Indonesia, Kiribati, Malaysia, Federated States of Micronesia, New Caledonia, New Zealand, Niue, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Tonga, and Vanuatu.

Sub-Group	Member	WMO Accession Date <i>(source WMO, 2014)</i>
South-East Asia (SEA)	Brunei Darussalam	26-Nov-1984
	Indonesia	16-Nov-1950
	Malaysia	19-May-1958
	Philippines	5-Apr-1949
	Singapore	24-Jan-1966
	Timor Leste	4-Dec-2009
Pacific Island Countries and Territories (PICT)	Cook Islands	18-Oct-1995
	Federated States of Micronesia	18-Mar-1980
	Fiji	5-Dec-1949
	French Polynesia	26-Mar-2003
	Kiribati	20-Sep-1995
	New Caledonia	5-Dec-1949
	Niue	31-May-1996
	Papua New Guinea	15-Dec-1975
	Samoa	11-Jul-1995
	Solomon Islands	6-May-1985
	Tonga	25-Feb-1996
	Tuvalu	22-Sep-2012
	Vanuatu	24-Jun-1982
Other	Australia	14-Mar-1949
	New Zealand	2-Apr-1948
	United Kingdom	14-Dec-1948
	United State of America	4-May-1949

1.2 Organization of Survey Questionnaire

The Survey questionnaire was designed to collect information from RA V Members under five broad headings: 1) Institutional Arrangement; 2) Management and Organization; 3) Operations and Services; 4) Challenges and Priorities; and 5) Expected outcomes from RA V-16. For ease and consistency of response, the majority of questions were 'closed', with respondents choosing from one or more defined answers. However, in instances where more subjective or narrative information was required, the questions were left 'open'. The Survey structure and questions were strongly based on a similar survey conducted by Regional Association VI (Europe) to allow for some comparisons between regional associations.

The Survey questionnaire is available at WMO, RAP website:

<http://www.wmo.int/pages/prog/dra/rap.php>

2 Institutional Arrangements

The purpose of this section is to present basic information about the National Meteorological and Hydrological Services (NMHSs) of RA V Members, including the position of the NMHS within Government, as well as the role and mandate of the NMHS in the provision of services.

2.1 Institutional Arrangements

The institutional set-up of NMHSs is governed by legislative frameworks, mandates and scope. The enactment of legislation and government priorities define the functional responsibilities of the NMHS and its position within the machinery of Government. In RA V, NMHSs operate under various titles and functional definitions, as described in Table 2.1 below.

Table 2.1: Formal title of NMHSs and their parent organization

RA V Member	Title of NMHS Parent organization
Australia	Bureau of Meteorology <i>Department of the Environment</i>
Brunei Darussalam	Brunei Darussalam Meteorological Department <i>Ministry of Communications</i>
Cook Islands	Cook Islands Meteorological Service <i>Ministry of Transport</i>
Federated States of Micronesia	Weather Service Office, Chuuk <i>FSM National Government</i>
Fiji	Fiji Meteorological Service <i>Ministry of Works, Transport and Public Utilities</i>
French Polynesia	Meteo-France French Polynesia Direction <i>Météo-France</i>
Indonesia	Badan Meteorologi, Klimatologi dan Geofisika (BMKG) <i>Office of the President</i>
Kiribati	Kiribati Meteorological Service <i>Office of the President</i>
Malaysia	Malaysian Meteorological Department <i>Ministry of Science, Technology and Innovation</i>
New Caledonia	Meteo-France Regional Service New Caledonia <i>Météo-France</i>
New Zealand	Meteorological Service of New Zealand Ltd
Niue	Niue Meteorological Service
Papua New Guinea	National Weather Service <i>Department of Transport</i>
Philippines	Philippine Atmospheric, Geophysical and Astronomical Services Administration <i>Department of Science and Technology</i>
Samoa	Meteorology Division <i>Ministry of Natural Resources and Environment</i>
Singapore	Meteorological Service Singapore <i>National Environment Agency</i>
Solomon Islands	Solomon Islands Meteorological Service <i>Ministry of Environment, Climate Change, Disaster Management & Meteorology</i>

RA V Member	Title of NMHS <i>Parent organization</i>
Tonga	Tonga Meteorological Service <i>Ministry of Infrastructure</i>
Vanuatu	Vanuatu Meteorological Services <i>Ministry of Climate Change and Natural Disasters</i>

2.2 Functional Scope

NMHSs possess a range of functions and often provide services across a number of areas in addition to meteorology, including hydrology, climate, oceanography and seismology. Responsibility for operational hydrology lies with agencies other than the NMHS in 14 of the RA V Members that responded to the Survey, with only the NMHSs in Australia, Fiji and the Philippines having responsibility for operational hydrology. Institutional arrangements for the provision of hydrological services are summarized in Table 2.2.

Table 2.2: Institutions responsible for hydrological services

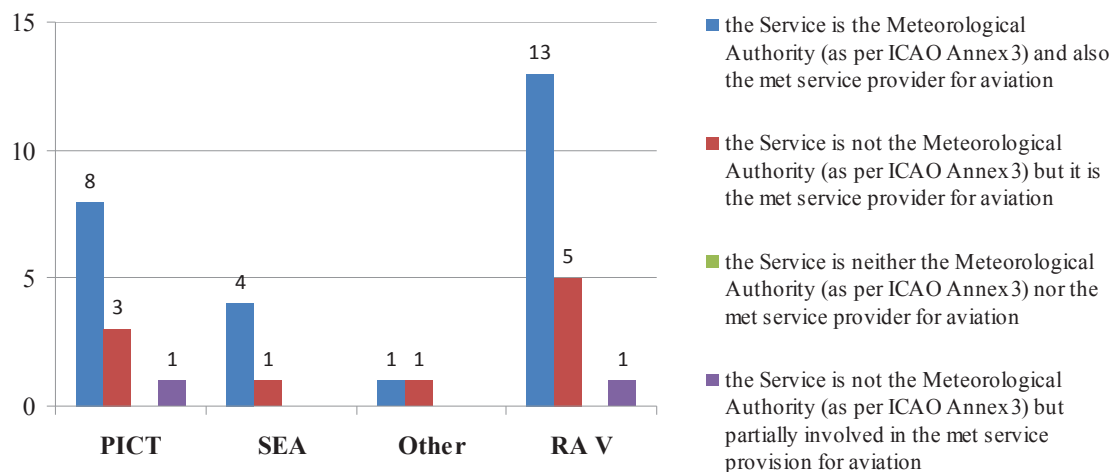
RA V Member	Organization Responsible for Hydrology
Australia	Australian Government, Bureau of Meteorology
Brunei Darussalam	Water Services Department
Cook Islands	Water Division, Ministry of Infrastructure
Federated States of Micronesia	None
Fiji	Fiji Meteorological Service
French Polynesia	<i>No Hydrological Service</i>
Indonesia	Directorate General for Water Resources, Ministry of Public Works
Kiribati	Ministry of Public Works
Malaysia	Department of Irrigation and Drainage
New Caledonia	DAVAR (Direction des Affaires Vétérinaires, Alimentaires et Rurales)*
New Zealand	New Zealand's seventeen Regional Councils
Niue	Water Division, Public Works Department
Papua New Guinea	Department of Environment and Conservation
Philippines	Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
Samoa	Water Resources Division, Ministry of Natural Resources and Environment
Singapore	Public Utilities Board (PUB), National Water Agency
Solomon Islands	Hydrology Division-Water Resources Department
Tonga	Geological Survey Unit
Vanuatu	Department of Water

* NHS doesn't exist in New Caledonia, but DAVAR (Direction des Affaires Vétérinaires, Alimentaires et Rurales) deals with water resources assessment activities

With respect to aeronautical meteorological services, the Survey sought information on each NMHS's role as the Meteorological Authority and Meteorological Service Provider and their compliance with ICAO Annex 3 protocols.

Thirteen respondents identified the NMHS as both the Meteorological Authority and the Service Provider. Five respondents identified the NMHS as the Meteorological Service Provider but not the Meteorological Authority, and one respondent identified the NMHS as neither, but that it participated in the provision of aeronautical meteorological services (see Figure 2.1)

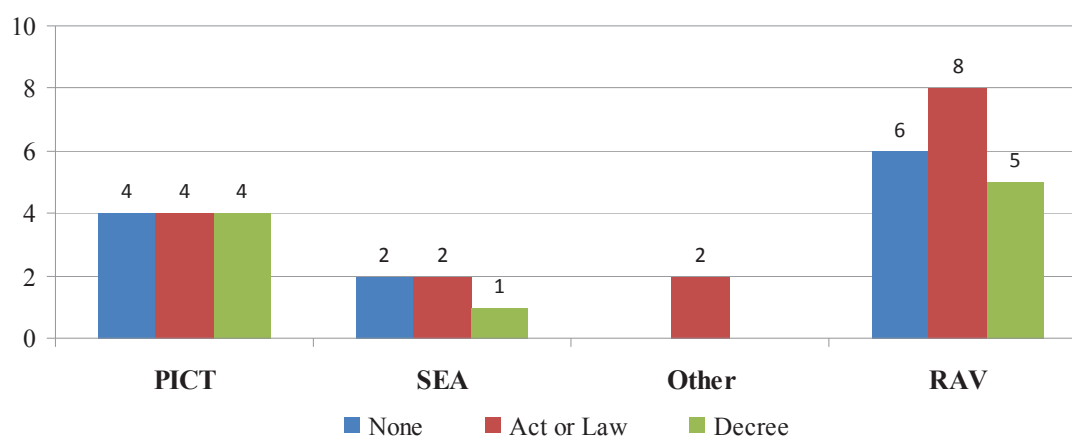
Figure 2.1: Provision of aeronautical meteorological services



2.3 Legislative Arrangements

Legal instruments for the establishment and function of the NMHS exist in 13 RA V Members. The type of legislative instruments varies, and includes Acts of Parliament, laws, statutory instruments and decrees. Eight Members operate under a Government Act, and five under a decree (see Figure 2.2). Six Members operate without either. Two Members (Fiji and Papua New Guinea) report that specific legislation relevant to the NMHS is under formulation and expected to be enacted by government soon. Where legislation does not exist, the need for assistance in developing such legislation should be assessed. The majority of existing legislation focuses on the meteorological and hydrological duties and responsibilities of the NMHS.

Figure 2.2: Legal instrument for meteorology



Specific details about each Member's legislative arrangements are described in Table 2.3. Seven NMHSs are working under meteorological Acts/Laws, two under civil aviation Acts, four by government decree/order and one under cabinet decision. Three NMHSs (Brunei Darussalam, Federated States of Micronesia and Kiribati) do not operate under such legislative instruments. The existing primary legislative Act that determines the function of NMHS services in RA V Member countries and territories is given in Table 2.3 below.

Table 2.3: Primary legislation that determines the functions of NMHS

RA V Member	Primary Legislative Act
Australia	Meteorology Act (1955), Water Act (2007)
Brunei Darussalam	None
Cook Islands	Meteorological Service Act 1995-96
Federated States of Micronesia	None
Fiji	Cabinet Decision
French Polynesia	Décret n°93-861 du 18 juin 1993 portant création de l'établissement public Météo-France
Indonesia	Law No. 31 Year 2009 on Meteorology, Climatology and Geophysics
Kiribati	None
Malaysia	Ministers of the Federal Government (No.2) Order 2013
New Caledonia	Décret n°93-861 du 18 juin 1993 portant création de l'établissement public Météo-France
New Zealand	The Meteorological Services Act (amended 1992)
Niue	Metrological Services Act 2013
Papua New Guinea	Civil Aviation Authority Act 2000

RA V Member	Primary Legislative Act
Philippines	Presidential Decree No. 78: Establishing The Philippine Atmospheric Geophysical And Astronomical Services Administration
Samoa	Ministry of Works Transport and Infrastructure and previous Ministry of Agriculture Forestry Fisheries and Meteorology Acts
Singapore	National Environment Agency Act, Cap 195
Solomon Islands	1985 Meteorology Act
Tonga	Civil Aviation Act 1990 Section 7
Vanuatu	The Meteorology Act No. 4 of 1989

2.4 Other Regulatory Frameworks

In addition to primary acts and legal frameworks for meteorology, many Members have other regulatory frameworks or mutual agreements/arrangements with users for meteorological and other services. The most common such frameworks are: a) Service level agreements with national civil aviation administrations; b) Letters of Agreement (LoA) or Memoranda of Understanding (MoU) with disaster response agencies; and c) MoU with other Members for data sharing, etc.

Each Member has their own regulatory framework for services delivery. Some have several stakeholder agreements and some have none. The details of some of the more important existing regulatory frameworks are given in Table 2.4.

Table 2.4: Additional regulatory frameworks of NMHSs

RA V Member	Regulatory framework
Australia	<ul style="list-style-type: none"> Financial Management and Accountability Act 1997 Public Service Act 1999
Brunei Darussalam	<ul style="list-style-type: none"> LoA with Air Traffic Services, Department of Civil Aviation (in the process)
Cook Islands	<ul style="list-style-type: none"> LoA with Air Traffic Control for Aviation MoU with BoM of Australia for Database MoU with Fiji Meteorological Service for aviation products
Federated States of Micronesia	Nil
Fiji	<ul style="list-style-type: none"> Again, need to make clear whether a blank is a missing response, or whether it means there are no frameworks
French Polynesia	<ul style="list-style-type: none"> Agreement with Civil Protection agency 2013-2017
Indonesia	<ul style="list-style-type: none"> Law No. 1 Year 2009 on the Aviation Law No. 17 Year 2008 on the Shipping Law No. 24 Year 2007 on Disaster Management Presidential decree No. 61 Year 2008 on the Agency for Meteorology, Climatology and Geophysics (BMKG) Government Regulation No. 46 Year 2012 on the implementation of

RA V Member	Regulatory framework
	BMKG Data Observation and Management <ul style="list-style-type: none"> • President Instruction No. 5 Year 2011 on Food Security • President Instruction No. 4 Year 2012 on Disaster Mitigation • MoU between BMKG and Directorate General of Civil Aviation • MoU between BMKG and Center for Volcanological and Geological Hazard Mitigation • MoU between BMKG and the National Agency for Disaster Management
Kiribati	<ul style="list-style-type: none"> • Drought Response Plan • Tsunami Action Plan
Malaysia	<ul style="list-style-type: none"> • Arrangement with DCA/MOD for Aviation Services • Arrangement with National Security Council for Weather- and Earthquake/Tsunami Related Disaster Warnings
New Caledonia	<ul style="list-style-type: none"> • Agreement with Civil Protection Agency • Agreements with French Civil Aviation Authority • Agreements with Department of Defense • Agreement with Public Health Agency • Agreements with Electricity Companies • Agreements with Media (TV, radios, newspapers, etc.)
New Zealand	<ul style="list-style-type: none"> • MetService is the Responsible Agency for warnings of severe weather in New Zealand's National Civil Defense and Emergency Management Plan.
Niue	nil
Papua New Guinea	<ul style="list-style-type: none"> • In the process of entering into: <ul style="list-style-type: none"> - Service Level Agreement with the PNG Air Services Limited; - MoU with the National Agriculture Research Institute (NARI) and the National Airports Corporation (NAC) and the Office of Climate Change and Development (OCCD)
Philippines	<ul style="list-style-type: none"> • Executive Order No. 128: Reorganizing the National Science and Technology Authority.
Samoa	<ul style="list-style-type: none"> • None
Singapore	<ul style="list-style-type: none"> • Service Agreement with the Civil Aviation Authority of Singapore for the provision of aviation meteorological services
Solomon Islands	<ul style="list-style-type: none"> • Essential Services Act and Civil Aviation Act
Tonga	<ul style="list-style-type: none"> • MoU with the Geological Survey Unit, Control Tower of the Tonga Airport Limited on volcanic ash reporting
Vanuatu	<ul style="list-style-type: none"> • Vanuatu Meteorological Services (Meteorological Charges) Regulations [Cap 204]

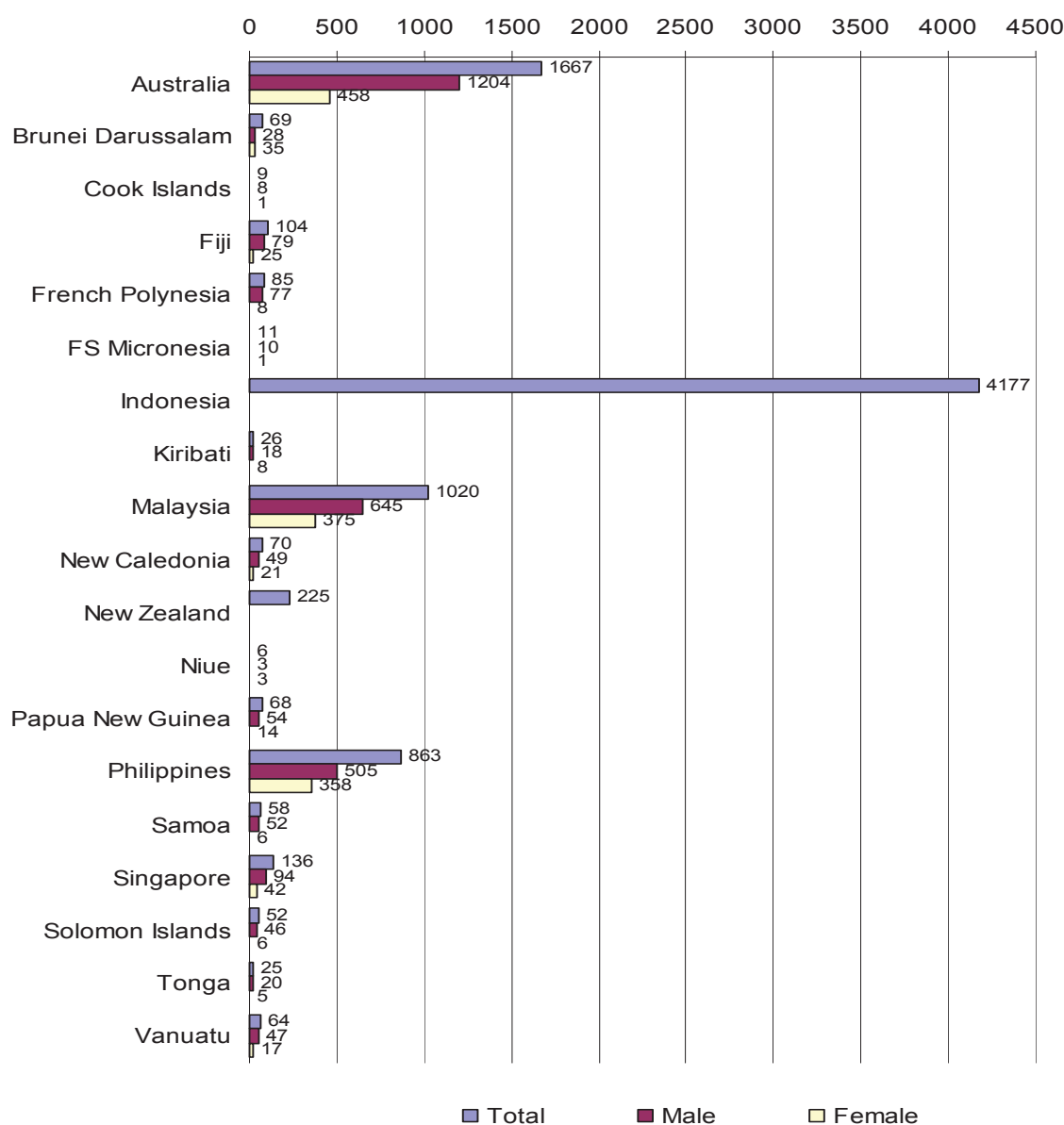
3 Management and Organization

This section summarizes the status of management and organizational capacities of RA V NMHSs in terms of human and financial resources, scope of services, and business model.

3.1 Human Resources

There is a vast range in the staffing level of NMHSs in RA V, from 6 (in Niue) to 4177 (in Indonesia). The total number of NMHS's employees in 19 responded Members of RA V is 8,735, with Indonesia contributing almost half this number. Staffing levels, including gender composition, are illustrated in Figure 3.1 (Note that gender information for Indonesia and New Zealand were not available).

Figure 3.1: Number of staff in NMHSs



The level of qualifications and work experience of staff and their strength in number indicate the overall capacity of the institution. The Survey reveals that overall in RA V; over 45% of NMHS staff possess education qualifications at the university degree level or higher. Australia and New Zealand have more than 70% staff members with university degrees, whilst Tonga and the Solomon Islands have 10% or less staff members holding a university degree.

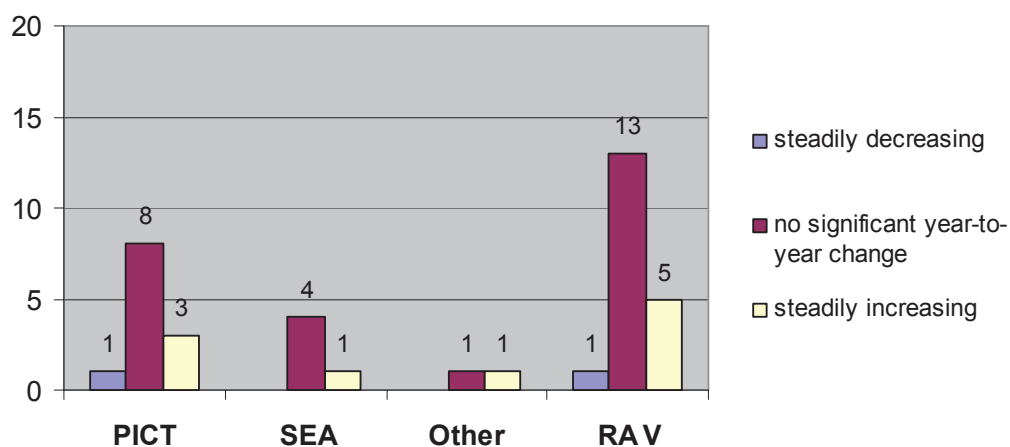
The average age of the staff of RA V NMHSs varies between 22 and 55 years old, with an average value of 37.27. The level of qualifications and average age of NMHS staff in RA V are shown in Table 3.1.

Table 3.1: Qualification and average age of staffing

RA V Member	Total NMHS staff	Staff with degree	Average age of staff
Australia	1667	1309	44
Brunei Darussalam	69	8	-
Cook Islands	9	1	32
Federated States of Micronesia	11	3	44
Fiji	104	25	-
French Polynesia	85	9	-
Indonesia	4177	1747	40
Kiribati	26	4	22
Malaysia	1020	229	-
New Caledonia	70	60	43
New Zealand	225	165	-
Niue	6	1	30
Papua New Guinea	68	19	-
Philippines	863	280	55
Samoa	58	12	32
Singapore	136	55	42
Solomon Islands	52	5	30
Tonga	25	2	35
Vanuatu	64	25	35

The trend of staffing in NMHSs in RA V during recent 3-5 years was reported to be more or less stable, with 13 Members reporting no significant change, whilst another four Members (Indonesia, New Zealand, Solomon Islands and Vanuatu) report an increase in numbers and one Member (New Caledonia) reporting a decrease. The breakdown of staffing trends by sub-region is illustrated in Figure 3.2.

Figure 3.2: Trends of staff numbers in recent 3-5 years



3.2 Budgetary Provision in Year 2013-2014

The total annual budgets of NMHSs across RA V vary considerably, with reported budgets ranging between USD 249.6 million and USD 138,776. The budget of individual Member's NMHS in their most recent fiscal years, in US dollars, is summarized in Table 3.2.

Table 3.2: Budget of NMHS for recent fiscal year

RA V Member	Budget 2013-14 (US dollars)
Australia	249,560,633
Cook Islands	269,388
French Polynesia	1,1874,145
Indonesia	136,493,900
Kiribati	300,076
Malaysia	24,138,549
New Caledonia	9,229,967
New Zealand	34,285,714
Niue	138,776
Papua New Guinea	2,404,959
Philippines	59,980,340
Samoa	843,323
Singapore	22,117,647
Solomon Islands	342,936
Tonga	400,247
Vanuatu	1,400,000

National Government is the main source of budget for NMHSs in RA V. Some NMHSs also receive budget under commercial arrangements (e.g., New Zealand) as well as through cost-recovery. Fourteen Members reported budgetary sources other than Government, including project funding from international donors and from domestic agencies.

3.3 Operational Scope

Meteorology, including observations, data processing and forecasting and warning services is the common operational responsibility of NMHSs in RA V. All but one respondent (New Zealand) also reported the provision of climate services as an operational responsibility. Table 3.3 summarizes the range of operational services provided by each NMHS in RA V.

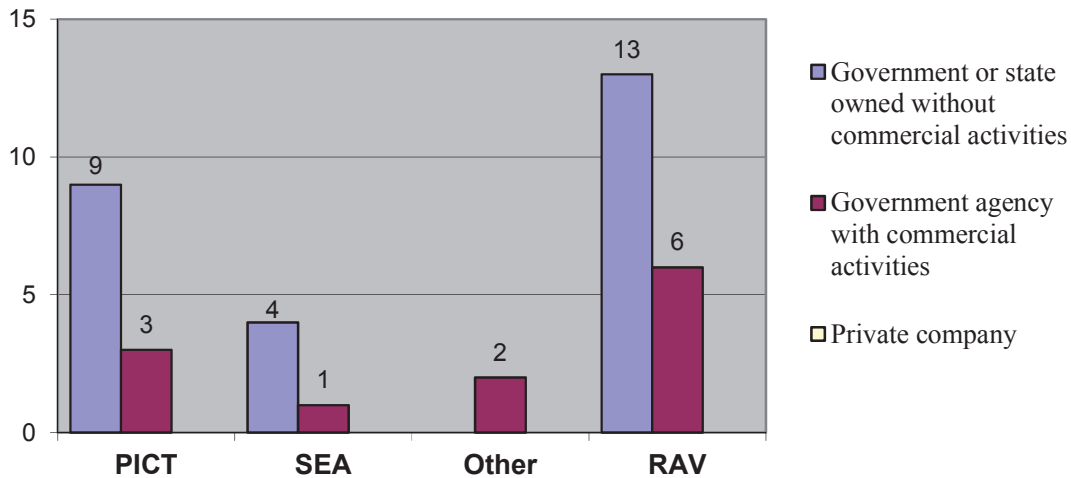
Table 3.3: Operational services provided by NMHS

RA V Member	Weather	Hydrology	Climate	Air/water quality	Oceanography	Geo-science
Australia	X	X	X	X	X	
Brunei Darussalam	X		X		X	
Cook Islands	X		X			
FS Micronesia	X		X			
Fiji	X	X	X			
French Polynesia	X		X			
Indonesia	X		X	X		X
Kiribati	X		X		X	
Malaysia	X		X	X	X	X
New Caledonia	X		X			
New Zealand	X					
Niue	X		X		X	
Papua New Guinea	X		X			
Philippines	X	X	X			
Samoa	X		X	X	X	X
Singapore	X		X			
Solomon Islands	X		X			
Tonga	X		X			
Vanuatu	X		X		X	

3.4 Business Model

The Survey examined the business model under which each NMHS operates. Most NMHSs in RA V are Government/State owned enterprises providing public weather services. Six RA V Members (Australia, Cook Islands, French Polynesia, New Caledonia, New Zealand and Singapore) reported that their NMHSs also engage in commercial activities (see Figure 3.3).

Figure 3.3: Business model of NMHSs



NMHS Quality Management Programme

The context for this Survey question was implementation of ICAO Annex 3 – Meteorological Service for International Air Navigation and the mandatory need for Quality Management Systems (QMSs) from 15 November 2012 in all contracting States.

The majority of Members responded that their NMHS has some kind of Quality Management programme. Ten Members (Brunei Darussalam, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, New Caledonia, New Zealand, Niue, Samoa and Singapore) have implemented QMS across their NMHS, including for aviation, whilst six (Australia, Indonesia, Malaysia, Papua New Guinea, Solomon Islands and Vanuatu) have implemented QMS for aviation services and three Members (Kiribati, Tonga and the Philippines) reported an absence of QMS frameworks.

3.5 Development/Strategic Plan for Next 3- 5 Years

The Survey examined the extent to which RA V Members had strategic plans or national development in place that identify the priorities of the NMHSs over the next few years. All but one Member reported having such plans in place.

The most frequently cited strategic priority areas identified in these plans were staff training and education, improved operational forecast and warning services and strengthened IT capability. Table 3.4 provides a summary of the responses, ordered according to the most commonly reported priority areas.

Table 3.4: Priority areas of Development/Strategic Plan

Priority Area	Sub-region			RA V
	PICT	SEA	Other	
Training, education and capacity building of staff	11	5	2	18
Improving operational forecasts including the warning products	10	5	2	17
Improved IT (including better use of web services and social media)	10	5	0	15
Enhancing the monitoring infrastructure	8	5	2	15
Improving the management and institutional arrangements	7	5	2	14
Enhanced climate services (implementation of the GFCS)	8	4	2	14
Research and development	6	5	2	13
Automation of the observing networks	6	5	1	12
Implementation of WIS	5	4	2	11
Extending services to new user sectors	7	4	0	11
Implementation of WIGOS	4	3	1	8
Development and implementation of new commercial services/products	3	3	1	7

4 Operations and Services

This section provides a summary of the scope of services delivered by Member's NMHSs and the areas in need of attention in terms of coverage, timeliness and meeting the needs of users.

4.1 Types of Services Provided

Table 4.1 summarizes the different types of services provided by RA V NMHSs. Public weather forecasts and warnings, and aviation services are provided by all and most also provide climate and marine services. Tailored services to specific users are commonly also provided along with agro-meteorological services. Consistent with earlier questions, only a small number of NMHSs have responsibility for hydrological services and geophysical services such as volcanoes or earthquakes.

Table 4.1: Type of services provided by NMHSs

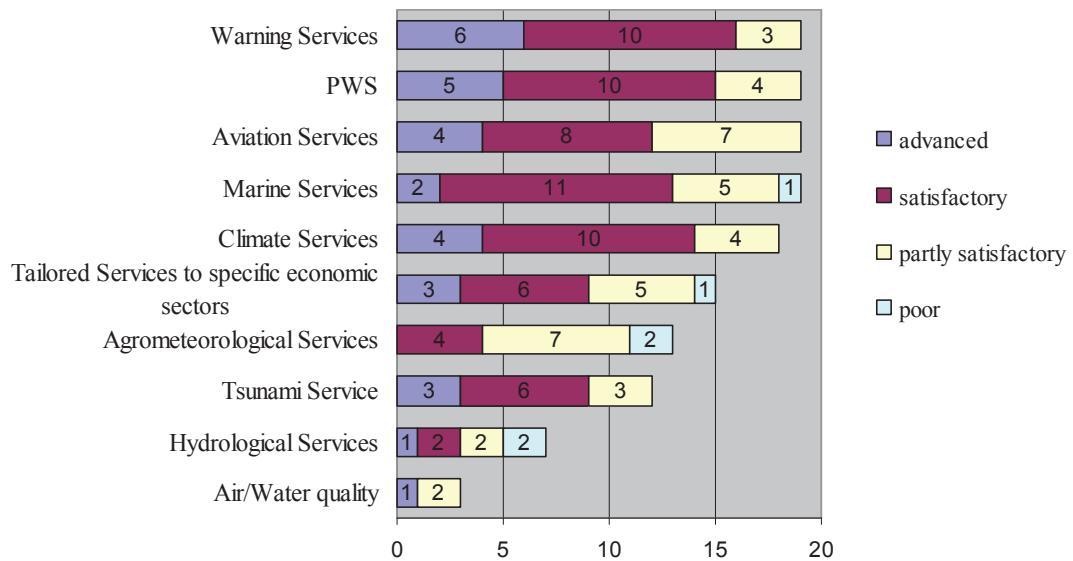
Type of Services	Sub-region			RA V
	PICT	SEA	Other	
Public weather services (PWS)	12	5	2	19
Warning services	12	5	2	19
Aviation services	12	5	2	19
Climate services	12	5	1	18
Marine services	10	5	2	17
Tailored services to specific economic sectors	5	5	2	12
Agro-meteorological services	6	4	1	11
Earthquake/Seismic services	6	2	-	8
Volcano services	4	2	1	7
Hydrological services	3	1	1	5
Air/water quality	1	1	-	2

4.2 Current Level of Service Provisions

An assessment of the current adequacy of service provision was provided by respondents and is summarized in Figure 4.1. The majority of respondents rated their NMHS service level as satisfactorily meeting most requirements. Public weather services, warnings, and climate services were most consistently rated as meeting or exceeding requirements. Aviation, tsunami services and tailored services were also rated as satisfactory or better by a majority of Members who provide these services. Agro-meteorology was identified by many respondents as only partly meeting requirements and was perhaps the service most in need

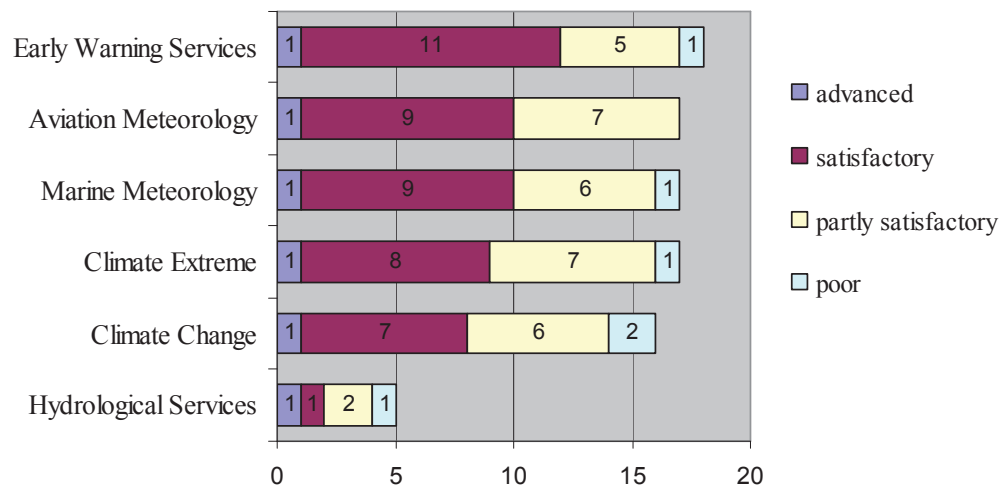
of development.

Figure 4.1: Current level of service provisions



Respondents were also asked to rate the adequacy of national research capability to support service delivery. Research in support of early warning systems and aviation services was seen as the most satisfactory, although in all instances, there were significant numbers of Members who rated the underpinning research as being only partly satisfactory. Only one respondent rated the research to be at an advanced level that meets or exceeds user requirements. Details are given in Figure 4.2 below.

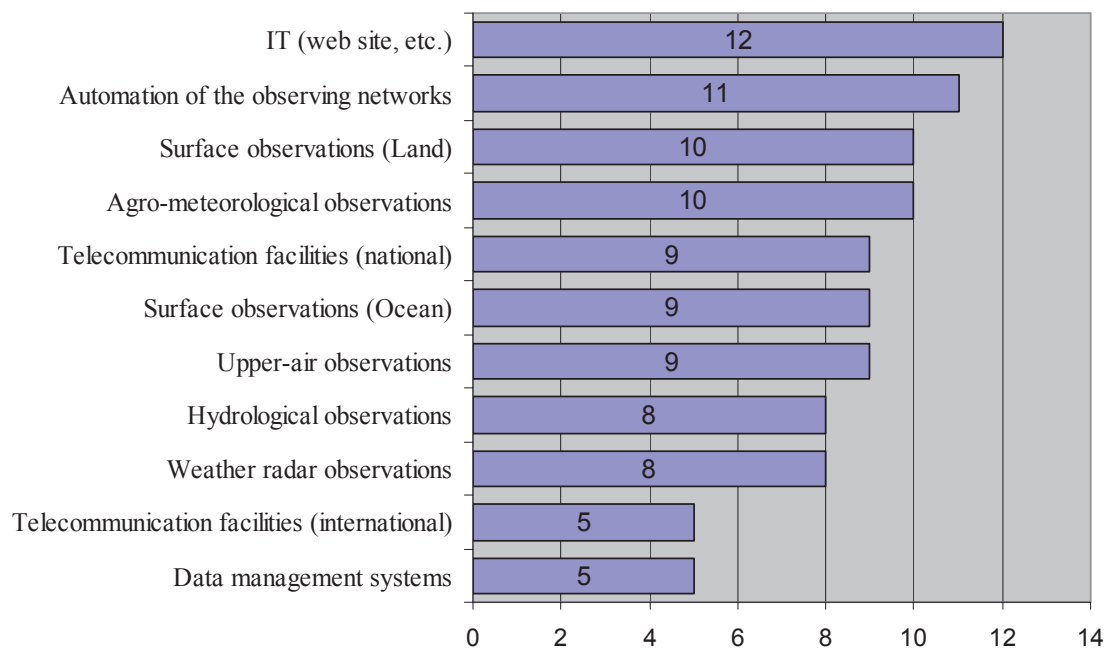
Figure 4.2: Level of research capabilities and development areas



4.3 Adequacy of Monitoring Infrastructure

Members were asked to rate the adequacy of monitoring infrastructure (observations and IT). Most commonly reported concerns related to IT services, automation of observing networks and the adequacy of agro-meteorological observing networks. Concerns about the adequacy of upper-air and surface observing networks, and of national telecommunication facilities were also widely reported. These results are summarized in Figure 4.3 below.

Figure 4.3: Inadequacy of equipment and infrastructure



These results by sub-region are presented in Table 4.2. The most common concerns are shared by both Pacific Islands and South-East Asian Members.

Table 4.2: Areas of equipment and infrastructure inadequacy

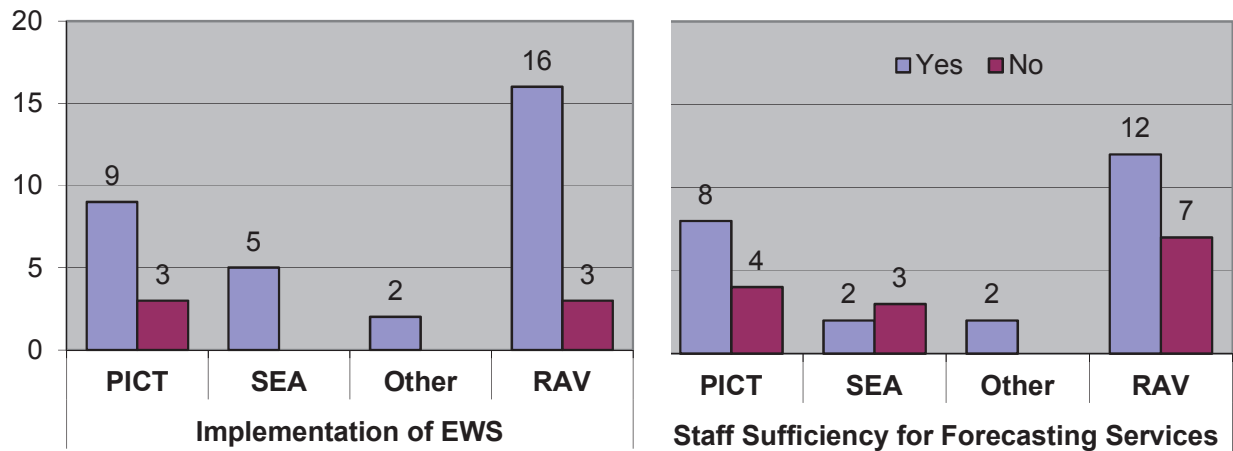
Areas of Inadequacy	Sub-Region			RA V
	PICT	SEA	Other	
IT (web site, etc.)	9	3		12
Automation of the observing networks	8	3		11
Surface observations (Land)	8	2		10
Agro-meteorological observations	7	3		10
Surface observations (Ocean)	6	3		9
Telecommunication facilities (national)	6	3		9
Upper-air observations	5	4		9
Weather radar observations	6	2		8
Hydrological observations	6	2		8
Telecommunication facilities (international)	3	2		5
Data management systems	2	3		5

4.4 Forecasting Capacity and Early Warning System (EWS)

The Survey concluded its section on operations and services with an assessment of the adequacy of staffing levels to deliver 24-7 operational services and also whether the NMHS has early warning systems in place. A significant number of Members (7 from 17 respondents) reported that they did not have sufficient staff to maintain around-the-clock operations.

On the other hand, all but three respondents (Federated States of Micronesia, Kiribati and Niue) reported that they had early warning systems implemented. These two aspects of NMHS capability are summarized in Figure 4.4.

Figure 4.4: Forecasting capacity of NMHSs



5 Challenges and Priorities for RA V

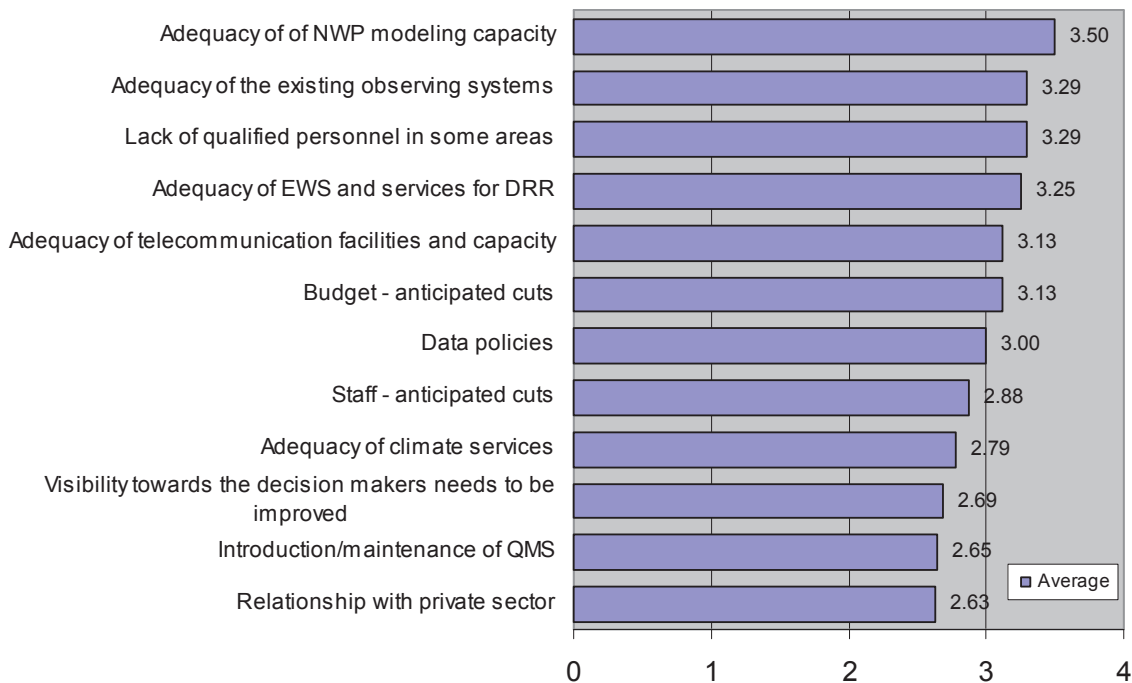
This section examines the major NMHS challenges and gaps that Members identified and the priority actions for the next 3-5 years.

5.1 Challenges

Members were asked to identify the most pressing challenges from a list of 12 predefined categories by rating the extent of the challenge on a 5-point scale (1 = no challenge; 2 = slight challenge; 3 = moderate challenge; 4 = moderate/serious challenge; 5 = serious challenge). The scores were then tallied and averaged to produce a list that illustrates the most significant challenges facing NMHSs in order of significance (see Figure 5.1 below).

The most significant/widespread challenges identified were: adequacy of NWP modeling capacity, adequacy of existing observing systems, lack of qualified personnel, and adequacy of EWS services for DRR. Anticipated budget cuts, adequacy of telecommunication facilities and capacity, data policies, and introduction and maintenance of QMS were also rated quite highly.

Figure 5.1: Challenges of NMHSs



An alternative analysis was also undertaken that identified the three most commonly identified challenges under each of the four categories slight, moderate, moderate/serious and serious. These are summarized in Table 5.1 below.

Table 5.1: Challenges at different levels

Serious	Moderate to Serious
<ul style="list-style-type: none"> • Adequacy of NWP modeling capacity • Lack of qualified personnel in some areas • Adequacy of EWS services for DRR 	<ul style="list-style-type: none"> • Adequacy of telecommunication facilities and capacity • Adequacy of existing observing systems • Data policies
Moderate	Slight
<ul style="list-style-type: none"> • Adequacy of climate services • Improved visibility towards the decision makers • Anticipated budget cuts 	<ul style="list-style-type: none"> • Relationship with private sector • Anticipated staff cuts • Introduction/maintenance of QMS

5.2 Future Priorities

Respondents were asked to identify up to six priority areas for future work to help address the challenges identified above. Free text was used for responses and a degree of interpretation was used to summarize this information and map it to the following six priority areas:

Priority 1: WIGOS/WIS: expressed by respondents in terms of the need to maintain and improve observing systems, the quality of observations, improve communication and information sharing, telecommunication and IT infrastructures and database management, and the regional and national implementation of WIGOS;

Priority 2: Capacity Building: identified by Members in terms of budget and staffing resource deficiencies, education and training needs, and modeling capacity;

Priority 3: Enhancement of Services – PWS, DRR/EWS and Aviation: expressed in terms of developing the capacity for adequate services in support of DRR, aviation, climate and hydrology, including medium- and long-range forecast services;

Priority 4: Strengthening of Climate Services including GFCS: expressed in terms of the need for improved climate services and the implementation of GFCS;

Priority 5: Improvement of Quality Management System (QMS): expressed in terms of observer and forecaster training in support of QMS implementation; and

Priority 6: Cooperation and Partnerships: expressed in terms of improving outreach to the community, encouraging engagement with local government, raising the effectiveness and efficiency of regional activities, building common positions on issues like data policy, commercialization and public/private sector relationships.

These priorities map closely to the priorities identified in both the WMO and RA V SOPs (see Table 5.2 below), with an additional emphasis given to cooperation and partnerships

Table 5.2: Priorities of WMO SOP, RA V SOP and survey

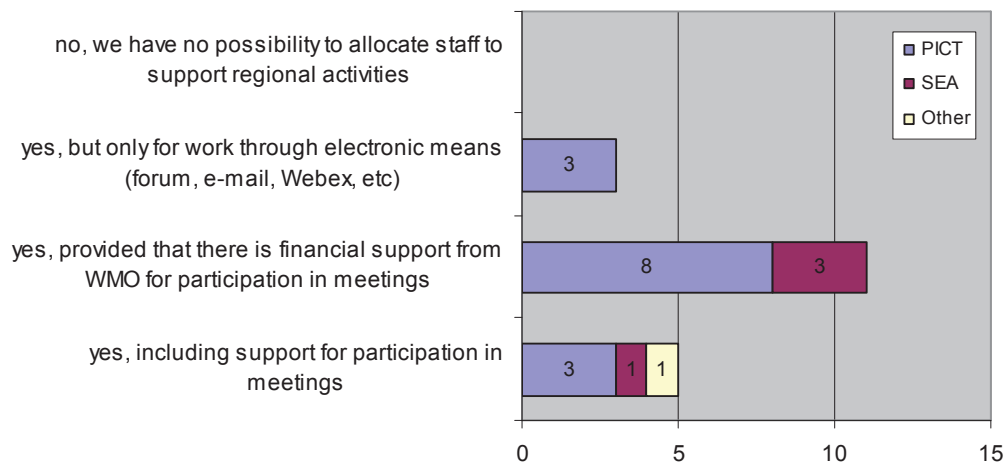
WMO-SOP	RA V-SOP	Survey
Global Framework for Climate Services (GFCS)	Better climate services	Strengthening of Climate Services including GFCS
Aviation meteorological services	Sustainable aviation services	Improvement of QMS
Capacity Building for developing and least developed countries	Capacity building	Capacity Building
Implementation of WIGOS and WIS	Improved infrastructure (data and information services) for weather, climate and water	WIGOS/WIS
Disaster Risk Reduction (DRR)	Improved end-to-end Multi-Hazard Early Warning Systems (MHEWS).	Enhancement of Services – PWS, DRR/EWS and Aviation
		Cooperation and Partnerships

Apart from this group of six priority areas, Members also expressed other priorities such as commercialization of services and strengthening the institutional-legislative framework of NMHSs.

5.3 Subsidiary Bodies

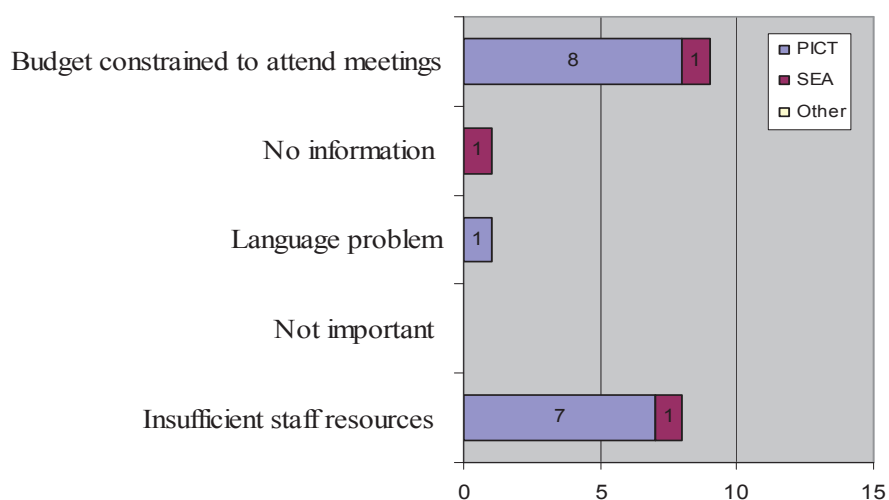
Members were surveyed to determine their ability to participate in the working mechanisms (Working Groups, Task Teams, etc.) of RA V. The majority of responses (11) indicate that participation in this work is only possible with financial support from WMO. Five Members indicated that they are able to allocate their own resources to the task, including to support participation in meetings of subsidiary bodies. Three Members expressed an ability to participate through electronic means only (e.g., web forum, email, Webex conferences). The responses are shown in Figure 5.2 below.

Figure 5.2: Support to subsidiary bodies



The main constraints on participation in RA V subsidiary bodies are summarized in Figure 5.3 below.

Figure 5.3: Reason for not supporting subsidiary bodies



Members were also asked to identify the main outcomes they seek from the work of the RA V subsidiary bodies, using a 3-point scale (1 = not very useful; 2 = useful; 3 = very useful). A clear preference was expressed for three types of activities: regional implementation plans (WIS, WIGOS, GFCS etc.), monitoring the performance of NMHSs to identify capacity gaps, and proposing relevant measures and providing guidance material on the implementation of priority programmes and projects. See Figure 5.4 below for a summary of the average usefulness rating across RA V and Table 5.3 for a numerical breakdown under each category.

Figure 5.4: Useful activities of subsidiary bodies

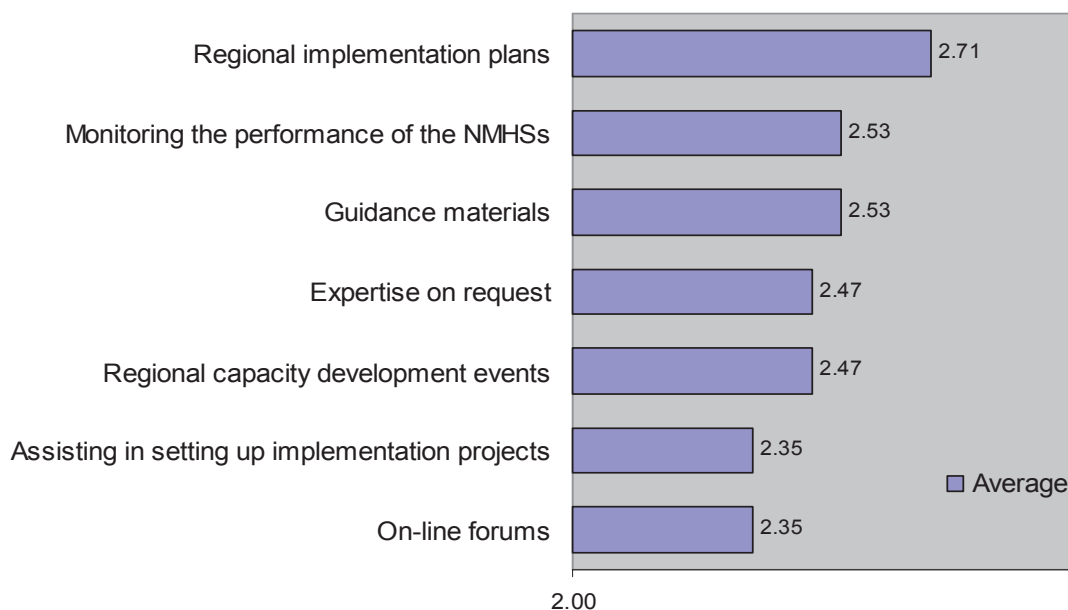


Table 5.3: Number of respondents by outcome and level of usefulness

Useful Outcomes	Sub-Region									RA V		
	PICT			SEA			Other			1	2	3
	1	2	3	1	2	3	1	2	3			
Regional implementation plans	-	4	7	-	1	3	-	-	2	-	5	12

Monitoring the performance of the NMHSs	1	3	7	1	-	3	-	1	1	2	4	11
Regional capacity development events	2	2	7	-	-	4	1	1	-	3	3	11
Guidance materials	-	5	6	-	1	3	1	-	1	1	6	10
Expertise on request	1	6	4	-	-	4	-	1	1	1	7	9
Assisting in setting up projects	1	6	4	1	-	3	-	1	1	2	7	8
On-line forums	1	5	5	-	1	3	1	1	-	2	7	8

Note: 1 = not very useful, 2 = useful and 3 = very useful

5.4 Supports from Members and Secretariat

The final part of this section examined the kind and level of support sought by RA V Members from the WMO Secretariat and from other Members.

With regard to support from Members, although there was a wide range of responses, the strongest emphasis was on joint/twinning capacity development projects, exchanges of expertise, training, technical support (e.g., for QMS, observation), infrastructure support and upgrades and assistance in developing regulatory and legislative frameworks.

Similarly, respondents identified financial and coordination support as a key expectation of the WMO Secretariat. The responses provided a number of suggestions for improving this, including financial assistance for participation in regional events that promote the visibility and mandate of NMHSs. Most of the responses indicate that the Secretariat should review its methods and working mechanisms at regional level in order to increase its efficiency and effectiveness in coordinating activities and assisting Members. Specific suggestions focused on support to develop strategic plans, the need for advice and information on available support options, facilitation of procurement of equipment parts and calibration of instruments, continued assistance with information sharing on regional activities, including capacity development programmes of external partners (such as SPREP, EU).

6 Expected Outcomes from the 16th Session of RA V

The final question of the Survey requested information on the expectations of Members for the coming 16th Session of RA V (RA V-16).

During RA V-16, Members wish to discuss existing economic constraints, data policy, the relationship between private and public sectors, to determine clear priorities for the next intersessional period and agree on concrete actions to address these.

The expected outcomes from RA V-16 include:

- Strengthening of regional cooperation and the preparation of an agreed strategic plan to guide the work of RA V for the next four years, including a clear articulation of a small number of high priority work areas;
- Plans for improving observing systems and minimizing the extent of missing data.

Other expected outcomes from the session are:

- More regional cooperation in the area of hydrology, expert exchange, instruments upgrade for early warning system (EWS);
- Regional training needs assessment plan;
- Improvement of the Pacific observation network for current use and long-term climate services;
- Identification of gaps and proposed treatments; and
- Agreement to establish on-line forums to discuss issues and concerns.

A number of Members posted their views to improve regional cooperation and performance of NMHSs. Some of the suggestions are:

- Reflect improvement of observing system together with missing data issue in the next strategic operating plan;
- Put more emphasis on cross-cutting issues such as DRR;
- Consider WMO involvement and activities with the Northern Hemisphere island countries;
- Enhance coordination and visible role in meteorology/hydrology for the Pacific region.