

# Survey on the Status of Human Resources in National Meteorological and Hydrological Services: Staff, Competencies and Qualifications

2023 edition

WEATHER · CLIMATE · WATER



WORLD  
METEOROLOGICAL  
ORGANIZATION

WMO-No. 1305



# Survey on the Status of Human Resources in National Meteorological and Hydrological Services: Staff, Competencies and Qualifications

2023 edition



WORLD  
METEOROLOGICAL  
ORGANIZATION

WMO-No. 1305

#### EDITORIAL NOTE

METEOTERM, the WMO terminology database, may be consulted at <https://public.wmo.int/en/meteoterm>.

Readers who copy hyperlinks by selecting them in the text should be aware that additional spaces may appear immediately following <http://>, <https://>, <ftp://>, <mailto:>, and after slashes (/), dashes (-), periods (.) and unbroken sequences of characters (letters and numbers). These spaces should be removed from the pasted URL. The correct URL is displayed when hovering over the link or when clicking on the link and then copying it from the browser.

WMO-No. 1305

© World Meteorological Organization, 2023

The right of publication in print, electronic and any other form and in any language is reserved by WMO. Short extracts from WMO publications may be reproduced without authorization, provided that the complete source is clearly indicated. Editorial correspondence and requests to publish, reproduce or translate this publication in part or in whole should be addressed to:

Chair, Publications Board  
World Meteorological Organization (WMO)  
7 bis, avenue de la Paix  
P.O. Box 2300  
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0) 22 730 84 03  
Email: [publications@wmo.int](mailto:publications@wmo.int)

ISBN 978-92-63-11305-4

#### NOTE

The designations employed in WMO publications and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of WMO concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or products does not imply that they are endorsed or recommended by WMO in preference to others of a similar nature which are not mentioned or advertised.

# CONTENTS

	<i>Page</i>
ACKNOWLEDGEMENTS.....	<b>v</b>
FOREWORD .....	<b>vi</b>
<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1 Survey design and administration .....	1
1.1.1 Survey dissemination and response rates .....	1
1.2 Major findings.....	3
<b>2. RESULTS OF THE SURVEY.....</b>	<b>12</b>
2.1 Staffing.....	12
2.1.1 Number of staff by gender .....	12
2.1.2 Number of staff by professional category .....	28
2.1.3 Number of staff with a university degree .....	60
2.1.4 Number of staff by age category .....	80
2.1.5 Staffing trends in the three to five years prior to the 2021 survey ...	84
2.2 Capacity development.....	88
2.2.1 Number of staff in need of training, by professional category .....	88
2.2.2 Number of experts expected to be trained.....	100
2.2.3 Level of priority for WMO support for fellowships.....	113
2.2.4 Areas in which NMHS staff training was needed.....	123
2.2.5 Completion of the Basic Instruction Package for Meteorologists (BIP-M) by personnel engaged in service provision	140
2.2.6 Training and assessment of personnel on WMO competency frameworks .....	147
<b>APPENDIX A. SURVEY FORM.....</b>	<b>177</b>
<b>APPENDIX B. LIST OF RESPONDENTS.....</b>	<b>181</b>



## **ACKNOWLEDGEMENTS**

This publication was prepared by the COMET Program at the University Corporation for Atmospheric Research (UCAR). The WMO Education and Training (ETR) Office and the WMO regional offices coordinated the data collection and verification.

Ms Sarah Ross-Lazarov of the COMET Programme is commended for the analysis of the data and preparation of the report. Dr Yinka R. Adebayo, Director of the WMO ETR Office, Mr Mustafa Adiguzel, Ms Luciane Veeck, Ms Han Seul Lee, Mr Bhanuka Kirinde, Mr Kyungjeen Park, and the WMO regional offices are also commended for their hard work and concerted efforts in collecting and verifying the data and in helping to bring this publication to fruition.

## FOREWORD

In order to establish a scientific basis for responding to the needs of WMO Members, the WMO Secretariat periodically conducts a comprehensive survey on the status of human resources in National Meteorological and Hydrological Services (NMHSs). The most recent survey, carried out during the second half of 2021, received a high level of participation in most regions, making the results representative of the trends and needs of most Members. In order to address Members' current needs, it is essential that these needs be correctly understood, in particular given the challenges faced by the global community over the past several years relating to the COVID-19 pandemic and the resulting social and economic upheavals, as well as the intensifying environmental consequences of climate change. I would therefore like to express my sincere appreciation to those Members who responded to the survey.

A comparison of the results of this most recent survey with those of the previous survey, conducted in 2017, reveals that the age distribution of the NMHS workforce remained constant from 2017 to 2021; the challenges of knowledge transfer and maintaining service levels amid widespread staff retirement are therefore still ahead of us. A comparison of the results of the two surveys also reveals that climate services has come to the fore as a top training priority and that Members have made progress regarding gender balance in their NMHS staffs.

About one third of the survey respondents reported that their NMHS staff levels were decreasing, which will complicate the ability of the remaining staff to fulfil their service roles. Fellowships are therefore needed to support continued human resource development. In addition, increasing the implementation levels and assessment frequencies of the WMO competency frameworks will support both knowledge transfer and community resilience. With respect to training needs, Members indicated that their primary priorities were in the areas of weather forecasting and climate services, although they also indicated that many other topics require attention, as well. The survey sheds light on the hard work that Members have done in recent years in promoting the education and training of their NMHS staffs, in hiring and retaining staff members in diverse professional fields, in improving the gender balance of their staffs, and in implementing the sixteen WMO competency frameworks. Even so, much more work lies ahead to meet the present and anticipated future challenges.

As I take this opportunity to commend all stakeholders and staff members for their efforts to serve the well-being and welfare of the people within their areas of service, I also invite all interested stakeholders to make use of the highly valuable information contained in this report. Finally, I wish to reiterate my commitment to working with all in addressing issues related to human resource development in WMO Member States and Territories.



Prof. Petteri Taalas  
(Secretary-General)

---



# 1. INTRODUCTION

WMO conducted worldwide surveys on Members' training requirements, opportunities and capabilities in the years 1985, 1989, 1994, 1998, 2002, 2006, and 2017. The results were extremely useful for the WMO Secretariat, WMO constituent bodies, Members and regional training centres, and the education and training collaborating partners within the WMO Global Campus initiative. The surveys focused on the status of human resources in National Meteorological and Hydrological Services (NMHSs), in particular with respect to the age bracket, gender, and professional status of NMHS staff and the training expectations and training priority areas for NMHS staff.

In addition to addressing the above areas, the current survey, conducted in the second half of 2021, also gathers data on the implementation and assessment status of the WMO competency frameworks.

This report is presented in two chapters. The first provides an introduction to the survey and presents some of its major findings. The second provides details of the results of the survey and gives insight into the state of human resources in Members' NMHSs. In particular, the survey results provide information on Members' training needs, expectations, and resources.

## 1.1 Survey design and administration

### 1.1.1 Survey dissemination and response rates

The 2021 survey was available online starting in July 2021. It was initially scheduled to remain available through October 2021; however, it was decided to extend the survey period through December 2021. Responses were received between 16 July 2021 and 10 January 2022. One hundred thirty-nine of 193 WMO Members responded.

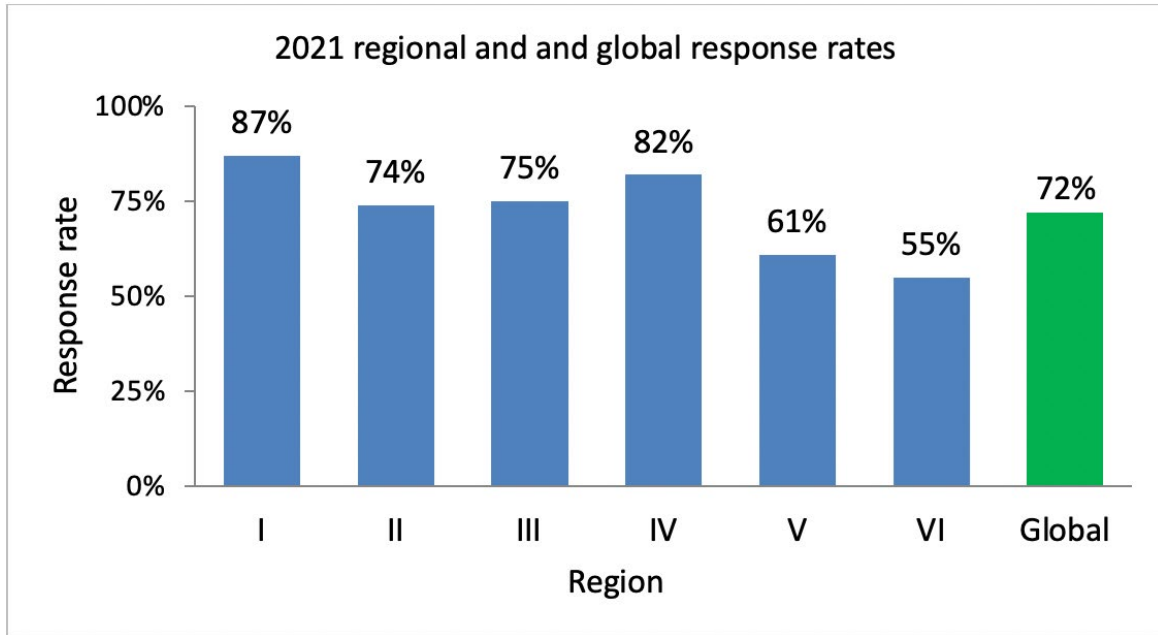
In February 2022, the respondents were asked to provide clarifications regarding some of their data. Ninety-eight Members sent in the additional information requested.

Table 1 shows the global and regional response rates.

**Table 1. Summary of responses to the WMO 2021 Survey on the Status of Human Resources in National Meteorological and Hydrological Services: Staff, Competencies and Qualifications**

<i>Region</i>	<i>Total number of Members</i>	<i>Number of responses received</i>	<i>Per cent of Members that responded</i>
I	53	46	87%
II	34	25	74%
III	12	9	75%
IV	22	18	82%
V	23	14	61%
VI	49	27	55%
Global	193	139	72%

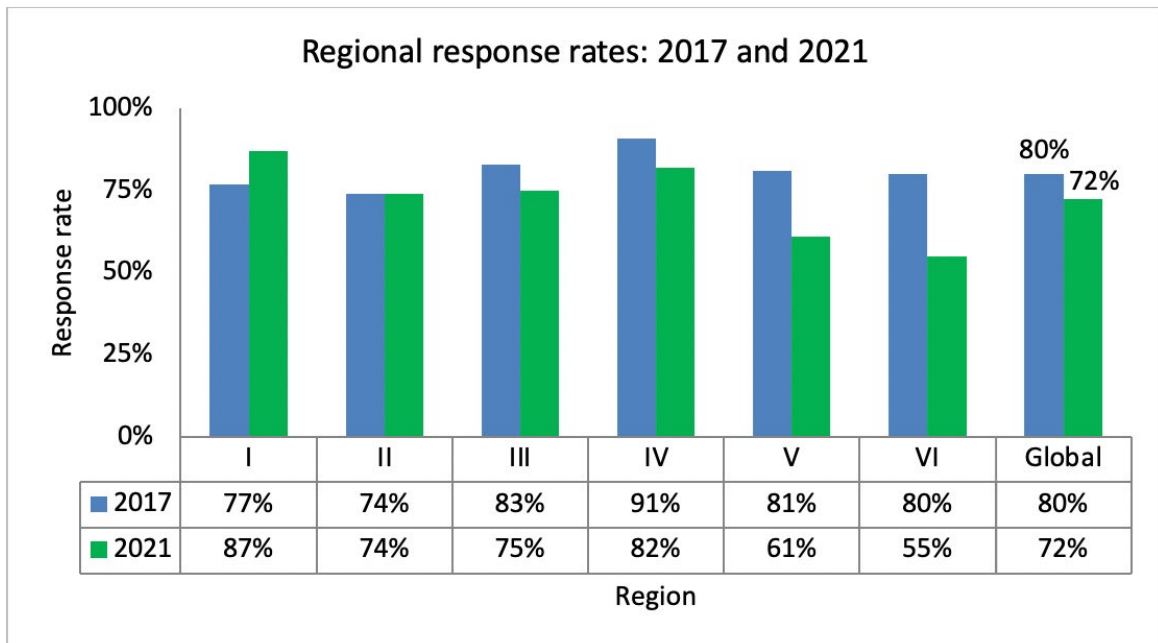
Figure 1 shows the response rates graphically and includes the global response rate.



**Figure 1. Ratio of received responses to number of Members in the six WMO regions and the global average**

The global response rate to the survey was 72%. Most WMO regions were well represented in the survey results: five of the six regions had a participation rate of at least 61%. Region I and Region IV had response rates of 82% and 87%, respectively; Region II and Region III had response rates of 74–75%; Region V’s response rate was 61%; and Region VI had the lowest response rate, with 55% of WMO Members in that region responding to the survey.

Figure 2 compares the global and regional response rates for the 2017 and 2021 surveys. The 2017 response rates are shown in blue. The 2021 response rates are shown in green.

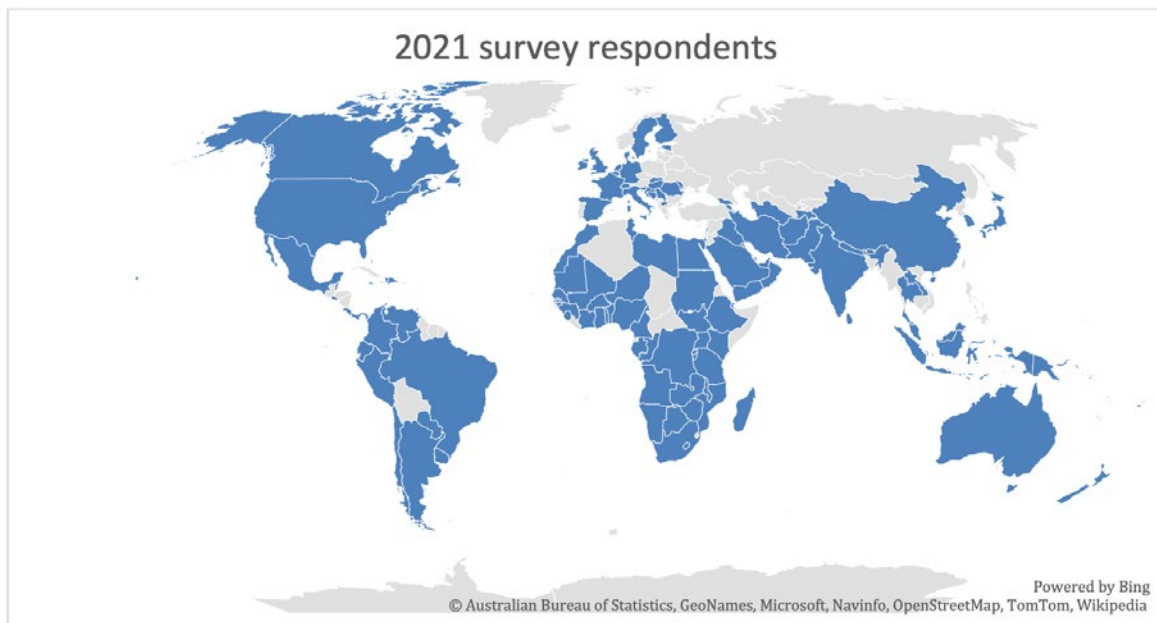


**Figure 2. Ratio of received responses to number of countries in the six WMO regions in 2017 and 2021**

The 2021 global response rate of 72% was down from 80% in 2017. The change in response rates from 2017 to 2021 varied among the regions. In Region I, more Members responded to the 2021 survey (87%) than responded to the 2017 survey (77%). The same percentage of Region II Members responded to the survey in both years (74%). The 2021 response rates for Region III and Region IV decreased by less than 10% with respect to 2017 (83% to 75% for Region III, and 91% to 82% for Region IV). Finally, substantially fewer Members of Region V and Region VI responded to the survey in 2021 than in 2017 (81% to 65% for Region V, and 80% to 55% for Region VI).

Although the regional response rates varied from 2017 to 2021, a majority of Members from every region responded to the survey. The global response rate for the two years was also comparable. The results of the 2021 survey included data for almost three quarters of all WMO Members.

Map 1 shows the survey respondents and non-respondents. The respondents are shaded blue, and the non-respondents are shaded pale grey.



**Map 1. 2021 survey respondents**

The blue shading in Map 1 visually depicts the good global coverage of the responses to the 2021 survey.

(A major limitation of displaying the survey results on a global map is that many Members, particularly the island states in the Caribbean and the Pacific areas, are not visible.)

Map 1 also shows that North Asia and eastern Europe were not well represented in the 2021 survey.

## 1.2 Major findings

### Number of staff by gender

- According to the respondents to the 2021 survey, at the time of the survey, there were 118 128 total NMHS staff members worldwide, including 76 252 men and 41 876 women.

- More survey respondents reported gender-balanced NMHS staffs (between 40% and 60% male staff members and between 40% and 60% female staff members) in 2021 than in 2017. In 2021, 32 respondents (24%) had gender-balanced NMHS staffs. In 2017, 25 survey respondents indicated that their NMHSs fit in this category (16% of the respondents).
- Several regions made notable progress regarding gender balance in their Members' NMHS staffs.
  - The percentage of respondents in whose NMHSs female staff members were substantially underrepresented was far lower in 2021 than in 2017 in Regions I, IV, and V.
  - The percentage of respondents with gender-balanced NMHS staffs approximately doubled from 2017 to 2021 in Regions I, II, and IV.
  - In 2021, the percentage of respondents with gender-balanced staffs in Region III increased to 67%.

### **Number of staff by professional category**

#### *Professional categories as whole groups*

There is no single staffing pattern universally used by NMHSs worldwide.

As was the case in 2017, according to the 2021 survey, Meteorological Technicians was still the largest category of NMHS staff (26 630 people), followed by Meteorologists (22 408 people). These two groups together continued to represent half of all NMHS staff worldwide.

Five professional categories (Meteorological Technicians, Meteorologists, Support Staff, Other Staff, and Managers) constituted 86% of all NMHS staff worldwide.

In general, the percentages of NMHS staff represented by each professional category in 2021 remained consistent with their percentages in 2017.

- One exception was Other Staff, whose percentage of total staff doubled from 2017 to 2021 in many regions.
- Another exception was Climate Services Staff, whose percentage of total staff decreased in five of the six regions, and decreased by half in three regions.
- Given that Climate Services was one of the top two training priorities in 2021, both worldwide and for five of the six regions, the decrease in the percentage of total staff represented by Climate Services Staff was an unexpected result.

#### *Gender balance in the professional categories*

It is somewhat uncommon for there to be a gender balance within any of the professional categories at individual NMHSs.

- For seven of the twelve professional categories listed in the 2021 survey, the majority of the respondents indicated that in their NMHSs, women were either moderately or substantially underrepresented. These categories were:
  - Manager
  - Meteorological Technician
  - Hydrological Technician
  - Meteorologist
  - Researcher
  - Other Staff
  - Hydrologist

In particular, women were substantially underrepresented as Managers in almost half of the respondents' NMHSs.

- For the remaining five professional categories, the underrepresentation of women was less widespread, although gender-balanced staffs were still uncommon. In these categories, fewer than half of the respondents had NMHS staffs that underrepresented women; however, about 20% to 30% of the respondents still had staffing patterns that substantially underrepresented women in all five of these categories. These categories were:
  - Support Staff
  - Climatologist
  - Customer Interactions and Communications Staff
  - Social Scientist
  - Lawyer
- The regions varied in their patterns of gender balance within the professional categories.

### **Number of staff with a university degree**

Globally, about two thirds (68%) of all NMHS staff members had a university degree at the time of the 2021 survey according to the respondents.

Regional workforces, when considered as a whole, varied in the percentage of their NMHS staff members that had a university degree, from a little over one third in Regions I and III, to about half in Regions IV and VI, and about three quarters in Regions II and V.

For 15% of the respondents, almost all of their staff members (75% to 100%) had a university degree. For 35% of the respondents, more than half of their staff members had a university degree.

The most common percentage range of staff members with a university degree was 25% to 49%. Forty-three per cent of the respondents fit into this category.

For almost a quarter of the respondents (22%), only a small percentage of their NMHS staff members (0% to 24%) had a university degree.

The percentage of NMHS staff members with a university degree varied among the regions.

### **Number of staff by age category**

The global distribution of NMHS staff members among the age brackets was identical at the time of the 2017 and the 2021 surveys according to the respondents: 17% were <30 years old, 26% were 31–40 years old, 27% were 41–50 years old, and 31% were more than 50 years old.

In the global NMHS workforce and in five of the six regions, more than half of all NMHS staff members were more than 40 years old.

Members varied widely in their percentages of NMHS staff members who were more than 40 years old, from 0% to 91%.

### **Staffing trends in the three to five years prior to the 2021 survey**

Globally, in the three to five years prior to the 2021 survey, 30% of NMHSs experienced a steadily increasing staffing trend; 40% experienced no significant year-to-year change in their staffing; and 30% experienced a steadily decreasing staffing trend.

In other words, 70% of the survey respondents indicated that their NMHS staff numbers either increased or remained stable during the three to five years prior to the 2021 survey.

In all regions, the NMHS staff numbers of at least half of the respondents either increased or remained stable in the three to five years prior to the 2021 survey.

Region V, in particular, experienced growth in this regard: 64% of Region V respondents saw increasing NMHS staff numbers in the three to five years prior to the 2021 survey, and all Region V NMHS staffs either grew or remained stable during that time.

Regions III and VI reported the highest percentages of Member NMHSs that experienced decreasing staff numbers in the three to five years prior to the 2021 survey, with over 40% in each region.

### **Number of staff in need of training, by professional category**

#### *Number of staff*

Worldwide, over 90 000 staff members in Member NMHSs were in need of training in various professional areas in 2021. The largest group was Meteorological Technicians (36 085 people), followed by Managers (20 769 people), Climatologists (11 819 people) and Meteorologists (9 911 people).

Large numbers of Researchers and Support Staff were also in need of training, as were moderate numbers of Hydrologists and Customer Interactions and Communications Staff.

More NMHS staff members were in need of training in 2021 (90 033) than in 2017 (39 305) according to the respondents to the 2021 and 2017 surveys.

- Most of this increase reflected the goals of the Region II respondents. In 2017, Region II respondents reported that about 20 000 of their NMHS staff members were in need of training; in 2021, this number was almost 73 000.
- The reported number of NMHS staff members in need of training in Regions I, III, and V also increased from 2017 to 2021.

The regions varied in their distributions of NMHS staff members in need of training in 2021.

- In Regions I, II, and III, for instance, 40% or more of the NMHS staff in need of training were Meteorological Technicians.
- Region II placed a special emphasis on training Managers and Climatologists, who constituted 26% and 15% of NMHS staff members in need of training, respectively.
- In Regions IV and V, on the other hand, 40% or more of the NMHS staff in need of training were Meteorologists.
- In Region VI, the largest groups of NMHS staff in need of training were evenly balanced between Meteorological Technicians and Meteorologists, with both representing about 30% of those individuals in need of training. Region VI placed a special emphasis on training Researchers, who constituted 10% of those NMHS staff members in need of training in that region.

#### *Priority levels for the needed training*

For three professional categories: Meteorological Technicians, Meteorologists, and Climatologists, the priority level for the training needed by most of the staff was moderate or high.

- For all regions, the priority level for the training needed by at least 82% of Meteorological Technicians was moderate or high. When the regional percentages were averaged, the global percentage of those Meteorological Technicians whose training was given a priority level of moderate or high was 88%.

- For five of the six regions, the priority level for the training needed by at least 88% of Meteorologists in need of training was moderate or high (for the remaining region, the percentage was 71%). When the regional percentages were averaged, the global percentage of those Meteorologists whose training was given a priority level of moderate or high was 89%.
- For all regions, the priority level for the training needed by at least 80% of Climatologists was moderate or high. When regional percentages were averaged, the global percentage of those Climatologists whose training was given a priority level of moderate or high was 86%.
- Specifically, the priority level for the training needed by NMHS staff in these three professional categories was high for 61% of Meteorologists, 58% of Meteorological Technicians and 58% of Climatologists.

For the other five professional categories covered in the survey, the global percentage of staff members whose training was given a priority level of moderate or high ranged from 67% to 79%.

- The priority level for the training needed by NMHS staff was high for 46% of Hydrologists, 42% of Customer Interactions and Communications Staff, 34% of Researchers, 32% of Managers, and 19% of Support Staff.

### **Number of experts expected to be trained**

Globally, the 2021 survey respondents expected that 15 995 experts would receive training during 2021; the 2017 survey respondents, in comparison, expected that 19 191 experts would receive training in 2017. (It is logical that the smaller group of 2021 survey respondents would expect fewer experts to receive training during the year of the survey than did the larger 2017 group.)

Although the reported number of experts for whom training was anticipated during the year of the survey was smaller in 2021 than in 2017 globally, it was higher in 2021 than in 2017 for experts in Regions II and V.

While an anticipated funding source could be confirmed for only about half of the experts worldwide for whom training was expected, according to the respondents to the 2021 survey, more thorough results were obtained for some of the regions. These results show that the anticipated funding sources changed between 2017 and 2021 for a number of respondents across the various regions.

- For example, the number of experts for whose training government funding was expected diminished dramatically in Region IV from 2017 to 2021, while this number increased in Region V.
- In addition, in several regions, the respondents anticipated that project funds and other scholarships would play a greater role in funding the experts' training in 2021 than they did in 2017.

### **Level of priority for WMO support for fellowships**

Globally, WMO support for fellowships for short courses was considered to be a high priority by 65% of the survey respondents.

- Globally, WMO support for fellowships for short courses was considered to be a medium priority by 17% of the respondents. Thus, the vast majority of the respondents (82%) considered WMO support for fellowships for short courses to be a high or a medium priority.

- In all the regions except for Region IV, the respondents rated WMO support for fellowships for short courses as a high priority more than any other fellowship type. In Region IV, the respondents rated WMO support for fellowships for Bachelor of Science (BSc) programmes as a high priority more than any other fellowship type.

About one third of all respondents considered WMO support for fellowships for BSc programmes and Master of Science (MSc) programmes to be a high priority. About one quarter of all respondents considered WMO support for fellowships for PhD programmes to be a high priority.

- More than 60% of all respondents considered WMO support for fellowships for BSc programmes and MSc programmes to be a medium or a high priority. Half of the respondents considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for the various fellowship types was given different levels of priority by the various regions.

- For instance, Region III respondents rated WMO support for fellowships for short courses as a high priority nearly unanimously.
- WMO support for fellowships for BSc programmes was a uniquely high priority in Region IV; in this region, more respondents (61%) rated WMO support for these fellowships as a high priority than WMO support for any other fellowship type.

### **Areas in which NMHS staff training was needed**

The top two training priorities for all respondents to the 2021 survey were Weather Forecasting and Climate Services.

- Weather Forecasting and Climate Services were also the top two training priorities for the respondents in each of the regions, with the exception of Region V, where the respondents' top two training priorities were Weather Forecasting, and Marine Meteorology and Oceanography.

The top two training priorities for all respondents to the 2017 survey were Weather Forecasting and Numerical Weather Prediction (NWP), and Instrumentation/Observation.

- Weather Forecasting and NWP, and Instrumentation/Observation were also the top two training priorities for the respondents to the 2017 survey in each of the regions, with the exception of Region III, where the respondents' top two training priorities were Weather Forecasting and NWP, and Climate Services.

Considered as a set of about ten training priorities, the priority training topics were consistent in the 2017 and 2021 surveys.

- The areas requiring the most training, according to the respondents to both surveys, included Weather Forecasting, Climate Services, Atmospheric Modelling and NWP, Instrumentation/Observation, and Hydrology/Hydrometeorology.
- Also important were Agrometeorology, Aeronautical Meteorology, Management and Administration Skills, and IT, Computing, and Data Processing.
- Marine Meteorology and Oceanography also figured among the most important training topics according to the 2021 survey respondents.

The regions indicated several different training priorities in the 2021 survey.

- For example, training in General Meteorology was a high priority for Region III, although this topic did not appear in the other regions' top priority lists.



- Similarly, Customer Interactions and Communications was among Region VI's training priorities, although it did not appear in the other regions' top priority lists.
- Instructional techniques for online and face-to-face training appeared among the top training priorities for both Region I and Region III. This topic received one or more priority votes in every region.

### **Completion of the Basic Instruction Packages by personnel engaged in service provision**

At the time of the 2021 survey, globally, 81% of the respondents indicated that at least some of their NMHS staff members providing meteorology services had completed the Basic Instruction Package for Meteorologists (BIP-M), and 49% of the respondents indicated that all of their NMHS staff members providing meteorology services had completed it.

The global completion rates were slightly lower for the Basic Instruction Package for Meteorological Technicians (BIP-MT): at the time of the survey, 79% of the respondents indicated that at least some of their NMHS staff members providing meteorological technician services had completed the BIP-MT, and 43% of the respondents indicated that all of their NMHS staff members providing meteorological technician services had completed it.

The global completion rates for the Basic Instruction Package for Hydrologists (BIP-H) and the Basic Instruction Package for Hydrological Technicians (BIP-HT) were much lower: at the time of the survey, about 23% of the survey respondents indicated that at least some of their NMHS staff members providing hydrology and hydrological technician services had completed these two Basic Instructional Packages, and about 5% of the respondents indicated that all of their NMHS staff members providing hydrology and hydrological technician services had completed them.

At the time of the 2021 survey, Region VI was leading the way with respect to all the relevant staff members at the NMHSs in that region completing the BIP-M, BIP-H, and BIP-HT, while Region II was leading the way with respect to all the relevant staff members at the NMHS in that region completing the BIP-MT.

### **Training and assessment of personnel on WMO competency frameworks**

#### *Overall*

At the time of the survey, five of the WMO competency frameworks had been implemented at least in part by the NMHSs according to a majority of survey respondents (60% or more): Aeronautical Meteorological Forecaster, Aeronautical Meteorological Observer, Meteorological Observations (OBS), Personnel – Operational Forecasting (PWS), and Satellite for Operational Meteorologists.

In order to provide information concerning the responses of a majority of the survey respondents in the area of assessment frequency, all assessment frequencies, including the longest assessment frequency of once every five years or more, were taken into account.

- At the time of the survey, three competency frameworks were being assessed once every five years or more according to about 60% of the respondents: Aeronautical Meteorological Forecaster, Aeronautical Meteorological Observer, and Meteorological Observations (OBS).

As Members continue to familiarize themselves with the competency frameworks, implementation levels and assessment frequencies are likely to increase.

In particular, the implementation level and assessment frequency of the Provision of Climate Services competency framework are likely to advance greatly in the near future since Climate Services was one of the top two areas in which NMHS staff training was needed (at the time of the survey, according to the respondents).

- At the time of the survey, Provision of Climate Services had been implemented in full by only 8% of the respondents; it had been implemented at least in part by 46% of the respondents.
- At the time of the survey, Provision of Climate Services was being assessed more than once a year by 11% of the respondents' NMHSs and at least every one or two years by 24% of the respondents' NMHSs. It was being assessed once every five years or more by 32% of the respondents.

*Status of implementation: The competency frameworks were sorted into four sets of implementation levels.*

1. In full: about 40% of the respondents' NMHSs  
At least in part: about 75% of the respondents' NMHSs
  - Aeronautical Meteorological Forecaster
  - Aeronautical Meteorological Observer
  - Meteorological Observations (OBS)
2. In full: 20% to 30% of the respondents' NMHSs  
At least in part: about 60% of the respondents' NMHSs
  - Personnel – Operational Forecasting (PWS)
  - Satellite for Operational Meteorologists
3. In full: 10% to 20% of the respondents' NMHSs  
At least in part: 35% to 50% of the respondents' NMHSs
  - Instrumentation (OBS)
  - Calibration (OBS)
  - Radar for Operational Meteorologists
  - Advisors – Disaster Prevention/Mitigation (PWS)
  - Observing Program and Network Management (OBS)
  - Weather Broadcasters & Communicators (PWS)
  - Marine Weather Forecasters
4. In full: fewer than 10% of the respondents' NMHSs  
At least in part: 35% to 50% of the respondents' NMHSs
  - Provision of Climate Services
  - Education and Training Providers
  - WMO Information System Competencies
  - Meeting User Requirements (PWS)

*Assessment frequency: The competency frameworks were sorted into four sets of assessment frequency.*

1. At least every one or two years: about 40% of the respondents' NMHSs  
Once every five years or more: about 60% of the respondents' NMHSs
  - Aeronautical Meteorological Observer
  - Meteorological Observations (OBS)
  - Aeronautical Meteorological Forecaster
2. At least every one or two years: 30% of the respondents' NMHSs  
Once every five years or more: 45% of the respondents' NMHSs
  - Satellite for Operational Meteorologists
  - Personnel – Operational Forecasting (PWS)
  - Instrumentation (OBS)
3. At least every one or two years: 20% to 30% of the respondents' NMHSs  
Once every five years or more: about 30% of the respondents' NMHSs

- Provision of Climate Services
  - Advisors – Disaster Prevention/Mitigation (PWS)
  - Observing Program and Network Management (OBS)
  - Meeting User Requirements (PWS)
  - Calibration (OBS)
  - Radar for Operational Meteorologists
4. At least every one or two years: 10% to 20% of the respondents' NMHSs  
Once every five years or more: 20% to 30% of the respondents' NMHSs
- Education and Training Providers
  - Weather Broadcasters & Communicators (PWS)
  - WMO Information System Competencies
  - Marine Weather Forecasters
-

## 2. RESULTS OF THE SURVEY

### 2.1 Staffing

#### 2.1.1 Number of staff by gender

##### Major findings

- According to the respondents to the 2021 survey, at the time of the survey, there was a total of 118 128 NMHS staff members worldwide, including 76 252 men and 41 876 women.
- More survey respondents reported gender-balanced NMHS staffs (between 40% and 60% male staff members and between 40% and 60% female staff members) in 2021 than in 2017. In 2021, 32 survey respondents (24%) had gender-balanced NMHS staffs. In 2017, 25 survey respondents indicated that their NMHSs fit in this category (16% of the respondents).
- Several regions made notable progress regarding gender balance in their Members' overall NMHS staffs.
  - The percentage of respondents in whose NMHSs female staff members were substantially underrepresented was far lower in 2021 than in 2017 in Regions I, IV, and V.
  - The percentage of respondents with gender-balanced NMHS staffs approximately doubled from 2017 to 2021 in Regions I, II, and IV.
  - In 2021, the percentage of respondents in Region III with gender-balanced staffs increased to 67%.

##### Detailed results

Table 2 shows the number of responses regarding the number of NMHS staff by gender, globally and in each region.

**Table 2. Number of responses regarding the number of NMHS staff by gender, globally and in each region**

	Region						
	I	II	III	IV	V	VI	Global
Number of respondents that shared information about the number of their staff members by gender	43	25	9	18	14	27	136
Total no. of survey respondents	46	25	9	18	14	27	139

Table 2 shows that 136 of the 139 respondents to the 2021 survey provided information regarding the total number of staff members at their NMHSs, distinguished by gender.

Table 3 shows the total number of male and female NMHS staff members that were reported by the survey respondents, globally and in each region.

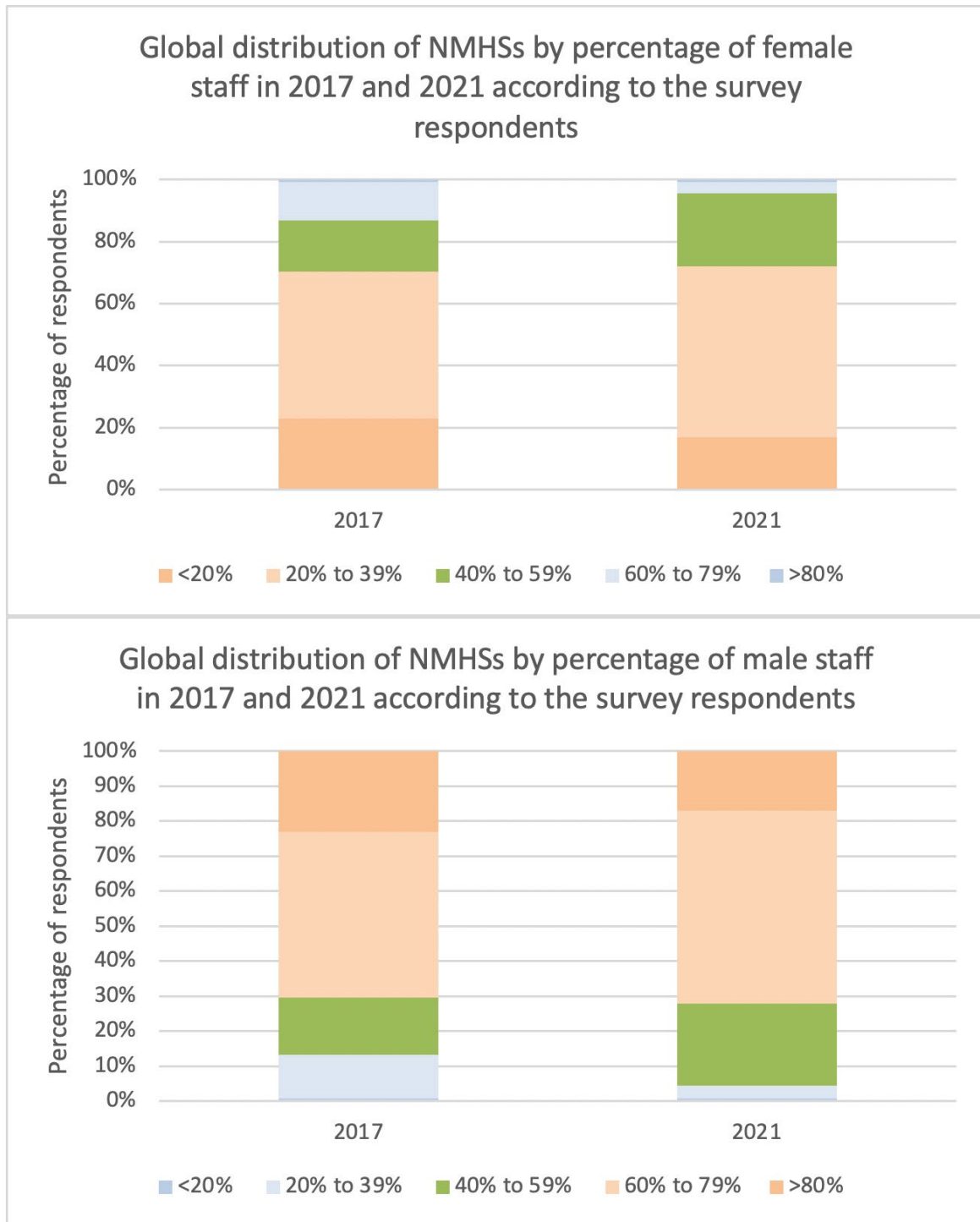
**Table 3. Total number of male and female NMHS staff members, globally and in each region**

<i>Number of staff members</i>	<i>Region</i>						<i>Global</i>
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>VI</i>	
Men	8 536	44 661	2 121	5 319	5 244	10 494	76 252
Women	3 306	24 999	1 475	2 174	3 140	6 659	41 876
Total	11 842	69 660	3 596	7 493	8 384	17 153	118 128

Table 3 shows that according to the survey respondents, at the time of the survey, there was a total of 118 128 staff members worldwide, including 76 252 men and 41 876 women.

### **Global**

Figure 3 shows the global distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents.



**Figure 3. Global distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents**

The dark orange colour represents the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue colour represents the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue colour represents the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 4 shows the global distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents.

**Table 4. Global distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents**

Percentage of staff	Percentage of NMHSs			
	Female staff		Male staff	
	2017	2021	2017	2021
<20%	23%	17%	1%	1%
20% to 39%	47%	55%	13%	4%
40% to 59%	16%	24%	16%	24%
60% to 79%	13%	4%	47%	55%
>80%	1%	1%	23%	17%
Total	100%	100%	100%	100%

Women were substantially underrepresented (<20% of staff) in fewer NMHSs in 2021 (17%) than in 2017 (23%).

Women were moderately underrepresented (20% to 39% of staff) in more NMHSs in 2021 (55%) than in 2017 (47%).

Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a slightly higher percentage of NMHSs had staffing patterns that underrepresented women in 2021 (72%) than in 2017 (70%).

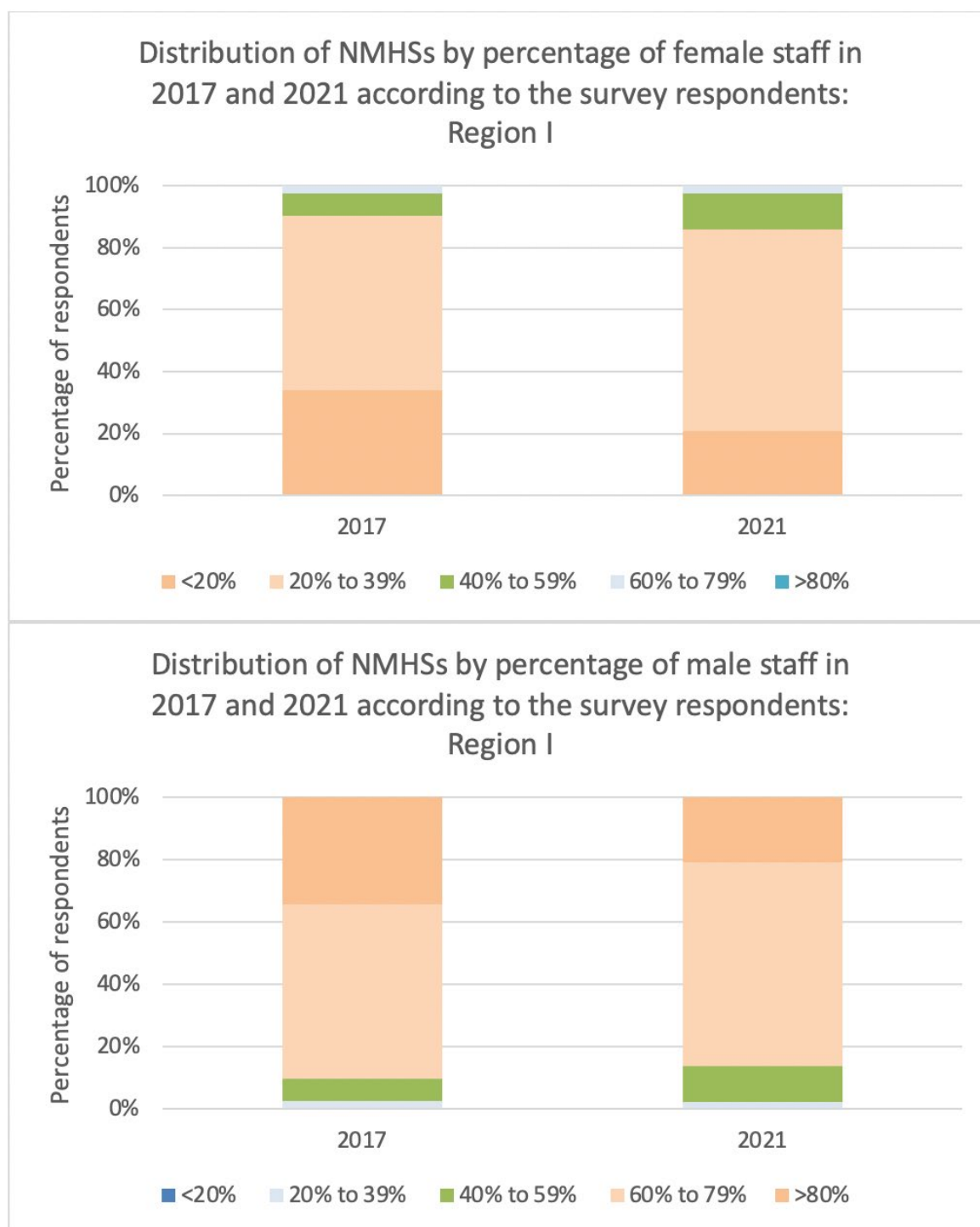
A higher percentage of NMHSs had staffing patterns that were gender balanced (40% to 59% of women and 40% to 59% of men) in 2021 (23%) than in 2017 (16%).

Women were 60% to 79% of staff in fewer NMHSs in 2021 (4%) than in 2017 (13%).

Women were more than 80% of staff in about 1% of NMHSs in both 2017 and 2021. (This was the case according to only one survey respondent in both years.)

## Region I

Figure 4 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region I according to the survey respondents.



**Figure 4. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region I**

The dark orange colour represents the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).



The pale blue colour represents the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue colour represents the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 5 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region I according to the survey respondents.

**Table 5. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region I**

<i>Percentage of staff</i>	<i>Percentage of NMHSs</i>			
	<i>Female staff</i>		<i>Male staff</i>	
	<i>2017</i>	<i>2021</i>	<i>2017</i>	<i>2021</i>
<20%	34%	21%	0%	0%
20% to 39%	56%	65%	2%	2%
40% to 59%	7%	12%	7%	12%
60% to 79%	2%	2%	56%	65%
>80%	0%	0%	34%	21%
Total	100%	100%	100%	100%

Figure 4 and Table 5 show that women were substantially underrepresented (<20% of staff) in far fewer NMHSs in 2021 (21%) than in 2017 (34%).

Women were moderately underrepresented (20% to 39% of staff) in more NMHSs in 2021 (65%) than in 2017 (56%).

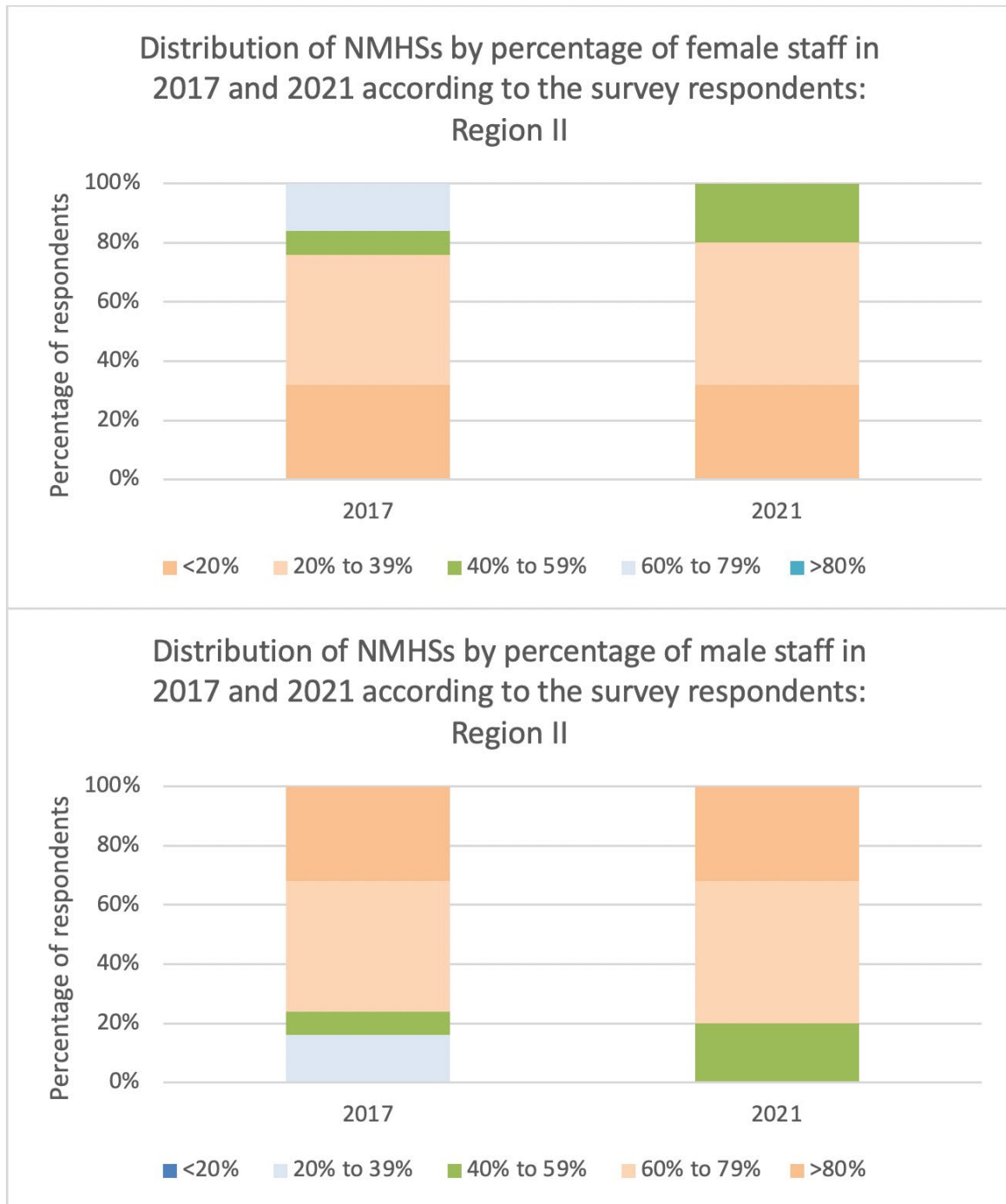
Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a slightly lower percentage of NMHSs had staffing patterns that underrepresented women in 2021 (86%) than in 2017 (90%).

The percentage of NMHSs with staffing patterns that were gender balanced (40% to 59% women and 40% to 59% men) almost doubled from 2017 (7%) to 2021 (12%).

The percentage of NMHSs for which women represented 60% to 79% of the staff was about the same in 2021 as it was in 2017 (2% in both years). The percentage of NMHSs for which women represented more than 80% of the NMHS staff was also about the same in 2021 as it was in 2017 (0% in both years).

## **Region II**

Figure 5 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region II according to the survey respondents.



**Figure 5. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region II**

The dark orange colour represents the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue colour represents the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue colour represents the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 6 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region II according to the survey respondents.

**Table 6. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region II**

<i>Percentage of staff</i>	<i>Percentage of NMHSs</i>			
	<i>Female staff</i>		<i>Male staff</i>	
	<i>2017</i>	<i>2021</i>	<i>2017</i>	<i>2021</i>
<20%	32%	32%	0%	0%
20% to 39%	44%	48%	16%	0%
40% to 59%	8%	20%	8%	20%
60% to 79%	16%	0%	44%	48%
>80%	0%	0%	32%	32%
Total	100%	100%	100%	100%

Women were substantially underrepresented (<20% of staff) in the same percentage of NMHSs in 2021 as in 2017 (32% – nearly one third of the respondents).

Women were moderately underrepresented (20% to 39% of staff) in slightly more NMHSs in 2021 (48%) than in 2017 (44%).

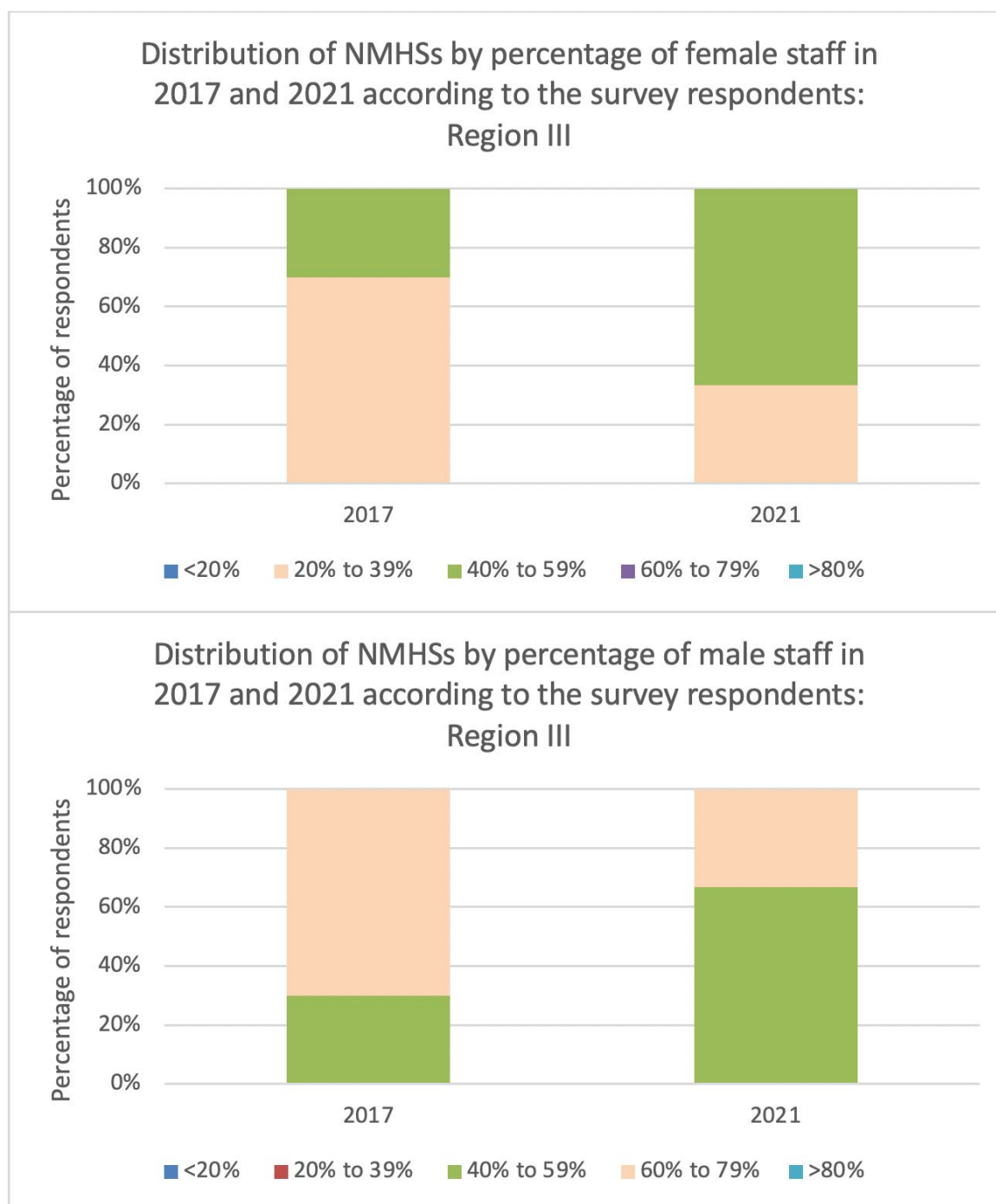
Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a slightly higher percentage of NMHSs had staffing patterns that underrepresented women in 2021 (80%) than in 2017 (76%).

The percentage of NMHSs with staffing patterns that were gender balanced (40% to 59% of women and 40% to 59% of men) more than doubled from 2017 (8%) to 2021 (20%).

While some NMHSs had staffs that were 60% or more female and 40% or less male in 2017, none did in 2021.

### **Region III**

Figure 6 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region III according to the survey respondents.



**Figure 6. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region III**

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff were gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

All of Region III’s respondents indicated that their NMHSs fit within these two gender distribution categories, so Figure 6 has no segments that are dark orange (less than 20% of the staff was female and 80% or more of the staff was male) or blue (60% or more of the staff was female and 40% or less of the staff was male).

Table 7 shows the distribution of female and male staff in NMHSs in Region III according to the 2017 and 2021 survey respondents.

**Table 7. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region III**

<i>Percentage of staff</i>	<i>Percentage of NMHSs</i>			
	<i>Female staff</i>		<i>Male staff</i>	
	<i>2017</i>	<i>2021</i>	<i>2017</i>	<i>2021</i>
<20%	0%	0%	0%	0%
20% to 39%	70%	33%	0%	0%
40% to 59%	30%	67%	30%	67%
60% to 79%	0%	0%	70%	33%
>80%	0%	0%	0%	0%
Total	100%	100%	100%	100%

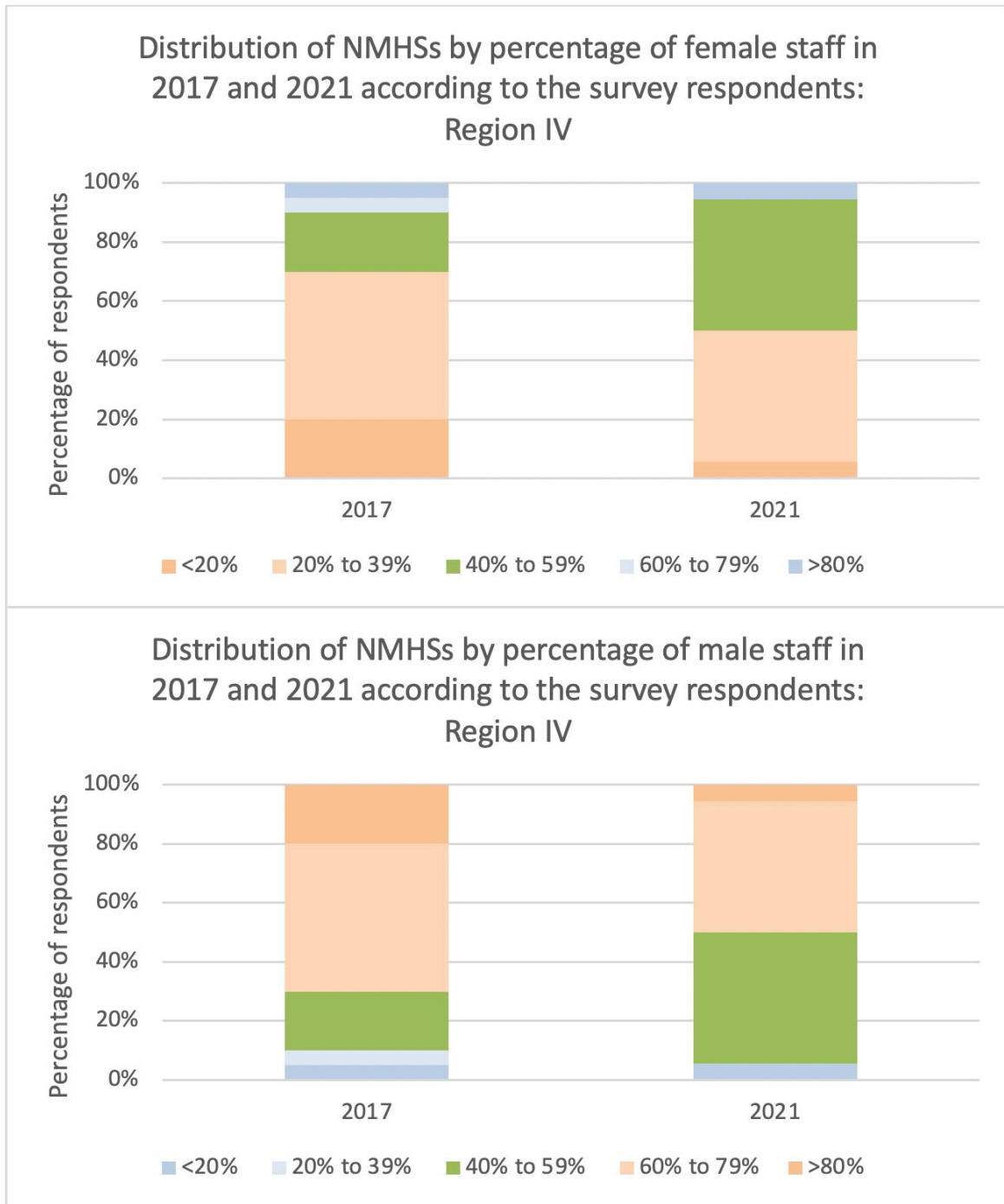
Figure 6 and Table 7 show that in 2017, 30% of Region III NMHSs had staffing patterns that were gender balanced (40% to 59% of women and 40% to 59% of men), and in the remaining 70% of NMHSs, women were moderately underrepresented (women were 20% to 39% of the staff and men were 60% to 79% of the staff).

According to the 2021 survey, the percentage of Region III NMHSs whose staffing patterns were gender-balanced increased to 67%, while the percentage of NMHSs in which women were moderately underrepresented decreased to 33%.

Thus, two-thirds of Region III respondents had gender-balanced NMHS staffing patterns, and the additional third was close behind.

#### **Region IV**

Figure 7 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region IV according to the survey respondents.



**Figure 7. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region IV**

The dark orange colour represents the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue colour represents the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue colour represents the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 8 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region IV according to the survey respondents.

**Table 8. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region IV**

<i>Percentage of staff</i>	<i>Percentage of NMHSs</i>			
	<i>Female staff</i>		<i>Male staff</i>	
	<i>2017</i>	<i>2021</i>	<i>2017</i>	<i>2021</i>
<20%	20%	6%	5%	6%
20% to 39%	50%	44%	5%	0%
40% to 59%	20%	44%	20%	44%
60% to 79%	5%	0%	50%	44%
>80%	5%	6%	20%	6%
Total	100%	100%	100%	100%

Women were substantially underrepresented (<20% of staff) in far fewer NMHSs in 2021 (6%) than in 2017 (20%).

Women were also moderately underrepresented (20% to 39% of staff) in fewer NMHSs in 2021 (44%) than in 2017 (50%).

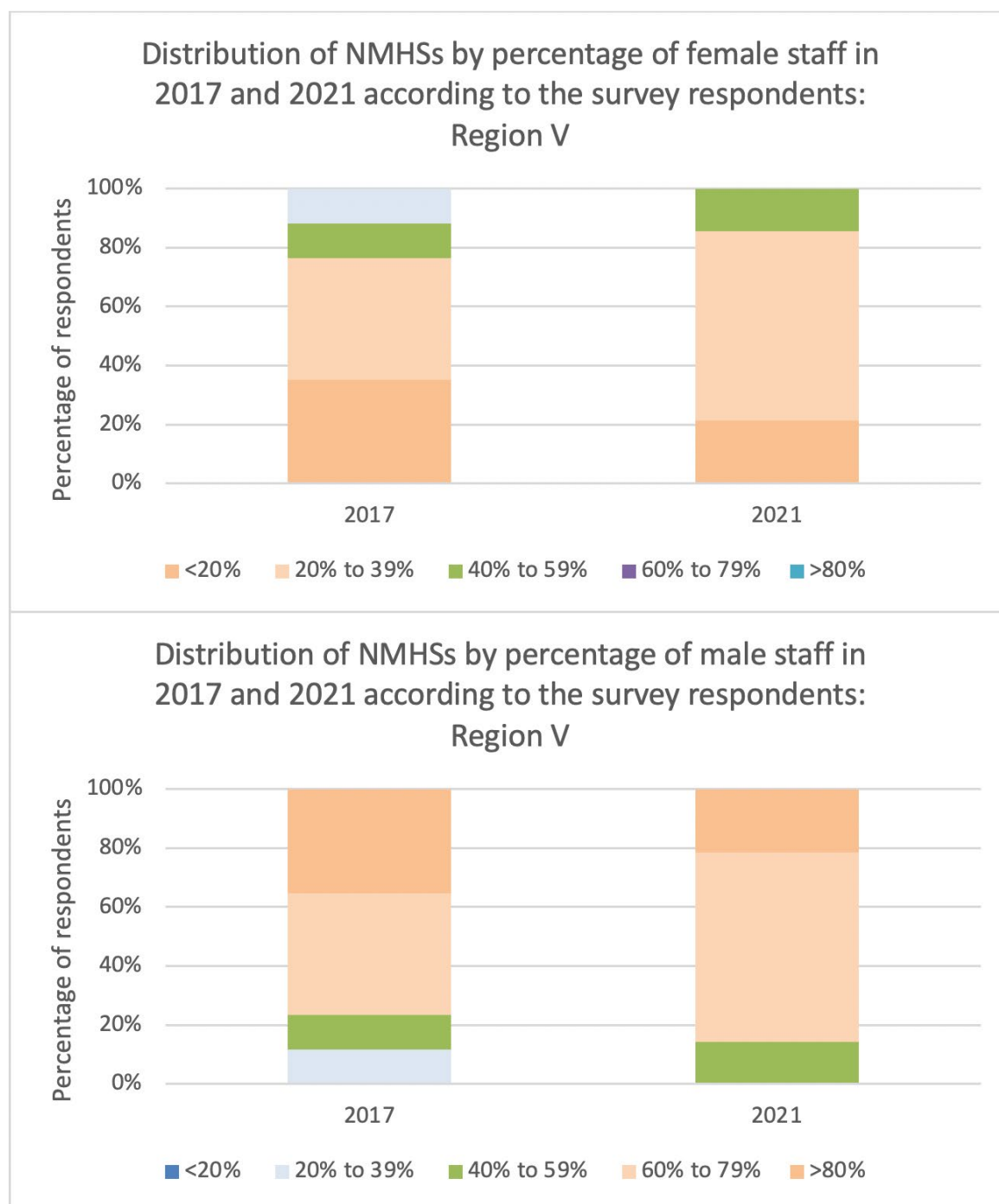
Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a lower percentage of NMHSs had staffing patterns that underrepresented women in 2021 (50%) than in 2017 (70%).

The percentage of NMHSs whose staffing patterns were gender balanced (40% to 59% of women and 40% to 59% of men) more than doubled from 2017 (20%) to 2021 (44%).

A small percentage of NMHSs had staffs that were 60% or more female and 40% or less male in both 2017 and 2021.

## **Region V**

Figure 8 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region V in according to the survey respondents.



**Figure 8. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region V**

The dark orange colour represents the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange colour represents the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green colour represents the number of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue colour represents the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).



The medium blue colour represents the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 9 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region V according to the survey respondents.

**Table 9. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region V**

<i>Percentage of staff</i>	<i>Percentage of NMHSs</i>			
	<i>Female staff</i>		<i>Male staff</i>	
	<i>2017</i>	<i>2021</i>	<i>2017</i>	<i>2021</i>
<20%	35%	21%	0%	0%
20% to 39%	41%	64%	12%	0%
40% to 59%	12%	14%	12%	14%
60% to 79%	12%	0%	41%	64%
>80%	0%	0%	35%	21%
Total	100%	100%	100%	100%

Women were substantially underrepresented (<20% of staff) in far fewer NMHSs in 2021 (21%) than in 2017 (35%).

Women were moderately underrepresented (20% to 39% of staff) in more NMHSs in 2021 (64%) than in 2017 (41%).

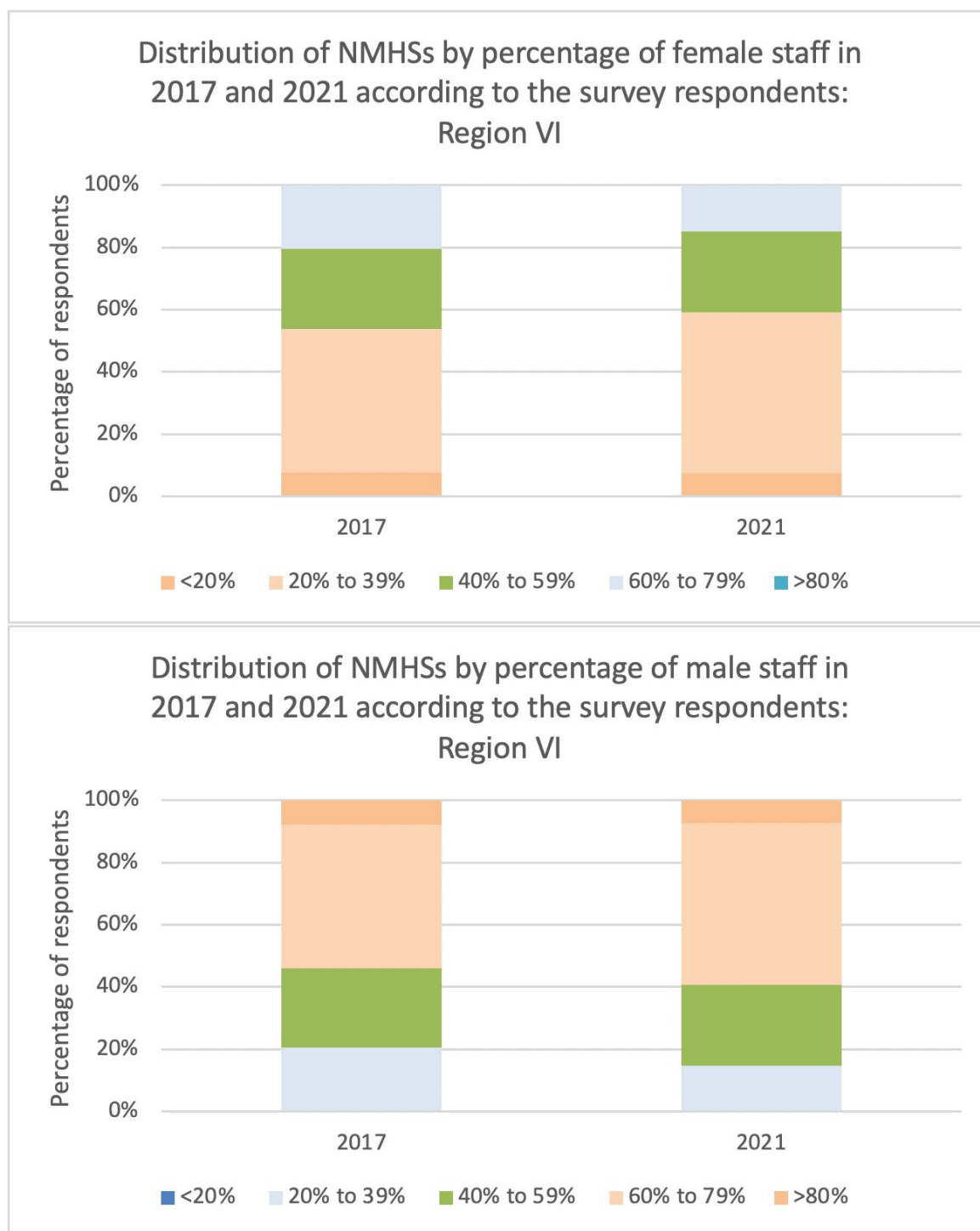
Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a slightly higher percentage of NMHSs had staffing patterns that underrepresented women in 2021 (86%) than in 2017 (76%).

A slightly higher percentage of NMHSs had staffing patterns that were gender balanced (40% to 59% of women and 40% to 59% of men) in 2021 (14%) than in 2017 (12%).

While some NMHSs had staffs that were 60% or more female and 40% or less male in 2017, none did in 2021.

## **Region VI**

Figure 9 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region VI according to the survey respondents.



**Figure 9. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region VI**

The dark orange segments show the number of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments show the number of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments show the number of NMHSs whose staff was gender balanced according to the definition of "gender balance" used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

Table 10 shows the distribution of NMHSs by percentage of female and male staff in 2017 and 2021 in Region VI according to the survey respondents.

**Table 10. Distribution of NMHSs by percentage of female and male staff in 2017 and 2021 according to the survey respondents: Region VI**

Percentage of staff	Percentage of NMHSs			
	Female staff		Male staff	
	2017	2021	2017	2021
<20%	8%	7%	0%	0%
20% to 39%	46%	52%	21%	15%
40% to 59%	26%	26%	26%	26%
60% to 79%	21%	15%	46%	52%
>80%	0%	0%	8%	7%
Total	100%	100%	100%	100%

Women were substantially underrepresented (<20% of staff) in about the same percentage of NMHSs in 2021 as in 2017 (7%–8% in both years).

Women were moderately underrepresented (20% to 39% of staff) in more NMHSs in 2021 (52%) than in 2017(46%).

Adding the categories of substantial and moderate underrepresentation of female staff together reveals that a higher percentage of NMHSs had staffing patterns that underrepresented women in 2021 (59%) than in 2017 (54%).

The same percentage of NMHSs had staffing patterns that were gender balanced (40% to 59% of women and 40% to 59% of men) in 2017 as in 2021 (26% in both years).

Fewer NMHSs had staffs that were 60% or more female and 40% or less male in 2021 (15%) than in 2017 (21%).

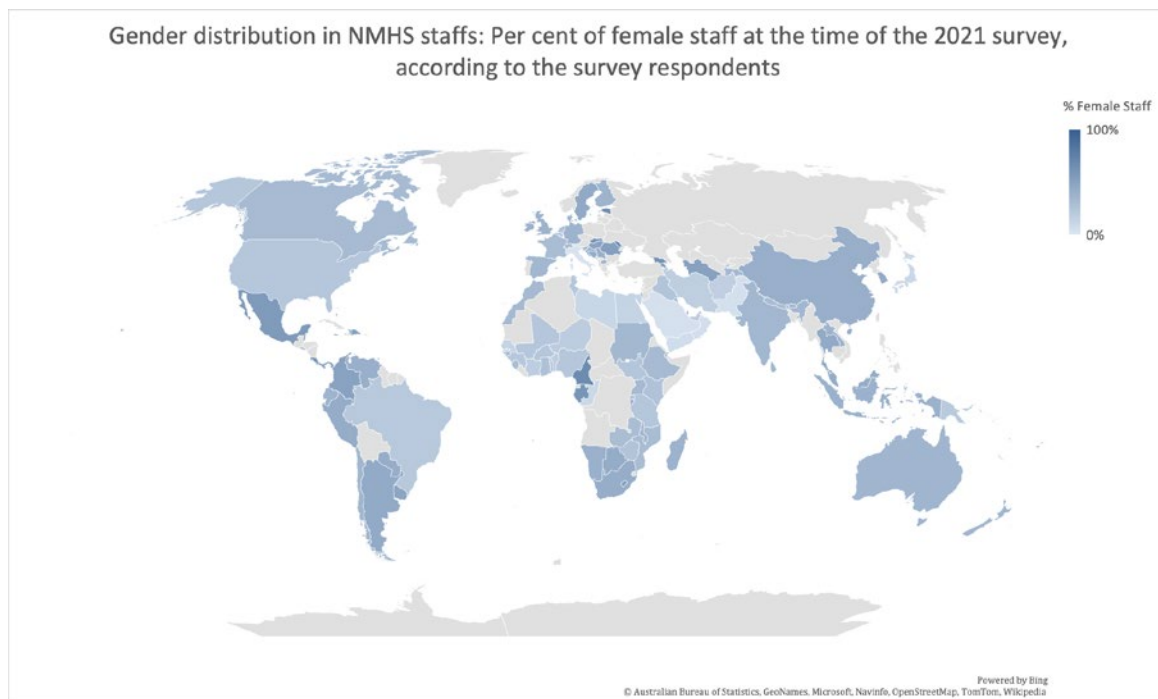
### **Map of gender distribution in overall NMHS staffing**

Map 2 shows the gender distributions reported by the 2021 survey respondents – specifically, the percentages of NMHS staffs that were women. The map is coloured on a gradient from very pale blue to dark blue.

- The Members whose NMHS staffs had the lowest percentages of women are shaded very pale blue. The lowest percentage according to the 2021 survey respondents was 0%.
- The Members whose NMHS staffs had the highest percentages of women are shaded dark blue. The highest percentage according to the 2021 survey respondents was 82%.
- The Members whose NMHS staffs were between 0% and 82% female are shaded gradually changing hues of blue.
- The Members whose survey respondents did not share information on this topic or that did not respond to the survey are shaded pale grey.

The moderate blue shades that colour many responding Members in Regions III and IV indicate that many Members in these two regions had gender-balanced NMHS workforces according to the survey respondents.

The paler blues that colour some of the Members in the other regions illustrate lower overall percentages of female staff in those Members' NMHSs.



**Map 2. Gender distribution in NMHS staffs: Per cent of female staff at the time of the survey, according to the survey respondents**

### 2.1.2 **Number of staff by professional category**

#### 2.1.2.1 **Professional categories as whole groups**

#### **Major findings**

- There is no single staffing pattern universally used by NMHSs worldwide.
- As was the case in 2017, in 2021, Meteorological Technicians was still the largest group of NMHS staff (26 630 people), followed by Meteorologists (22 408 people). These two groups together continue to represent half of all NMHS staff worldwide.
- Five professional categories (Meteorological Technicians, Meteorologists, Support Staff, Other Staff, and Managers) constitute 86% of global NMHS staff.
- In general, the percentages of NMHS staff represented by each professional category in 2021 remained consistent with their percentages in 2017.
  - One exception was Other Staff, whose percentage of total staff doubled from 2017 to 2021 in many regions.
  - Another exception was Climate Services Staff, whose percentage of total staff decreased in five of the six regions, and decreased by half in three regions.

- Given that Climate Services was one of the top two training priorities in 2021, both worldwide and for five of the six regions, the decrease in the percentage of total staff represented by Climate Services Staff was an unexpected result.

### Detailed results

Of the 139 Members that responded to the 2021 survey, 136 contributed information about the number of staff that work in various professional categories in their NMHSs. Table 11 shows the number and per cent of respondents that reported having staff in each professional category.

**Table 11. Number and per cent of respondents that reported having staff in each professional category**

<i>Professional category</i>	<i>No. of respondents that reported having staff in the prof. category</i>	<i>Per cent of respondents that reported having staff in the prof. category</i>
Meteorologist	131	96%
Manager	130	96%
Met Tech	126	93%
Support	118	87%
Climate	101	74%
Other	83	61%
Customer/Comms	76	56%
Researcher	75	55%
Hydrologist	58	43%
Lawyer	54	40%
Hydro Tech	42	31%
Soc Scientist	14	10%
Total no. of respondents that reported prof. category information	136	

Table 11 shows that more respondents reported the number of staff in their NMHSs for the more common professional categories than for the less common ones. For instance, 131 respondents reported a value (including zero) for the number of Meteorologists in their NMHSs, while only 14 respondents reported a value for the number of Social Scientists.

These response rates, which vary by professional category, may indicate that respondents sometimes did not add zeros to the survey fields for the professional categories in which they had no staff members. In analysing the survey results, however, it was not assumed that blank survey fields were equal to zeros. The blank fields were handled as non-responses, even when a respondent included information for other fields in the same survey question. In interpreting the survey results, it is important to note that for some of the less common professional categories, few Members reported information.

Table 12 shows the global and regional numbers of NMHS staff who were working in each of twelve professional categories at the time of the survey according to the respondents. Table 13 shows the percentages of NMHS staff represented by each category.

The tables are sorted by the global numbers or averages (the far right columns), from largest to smallest. The regional and global percentages were calculated by averaging the percentages for individual Members. Thus, the percentages in Table 13 do not correspond to the group numbers of total staff reported in Table 12.

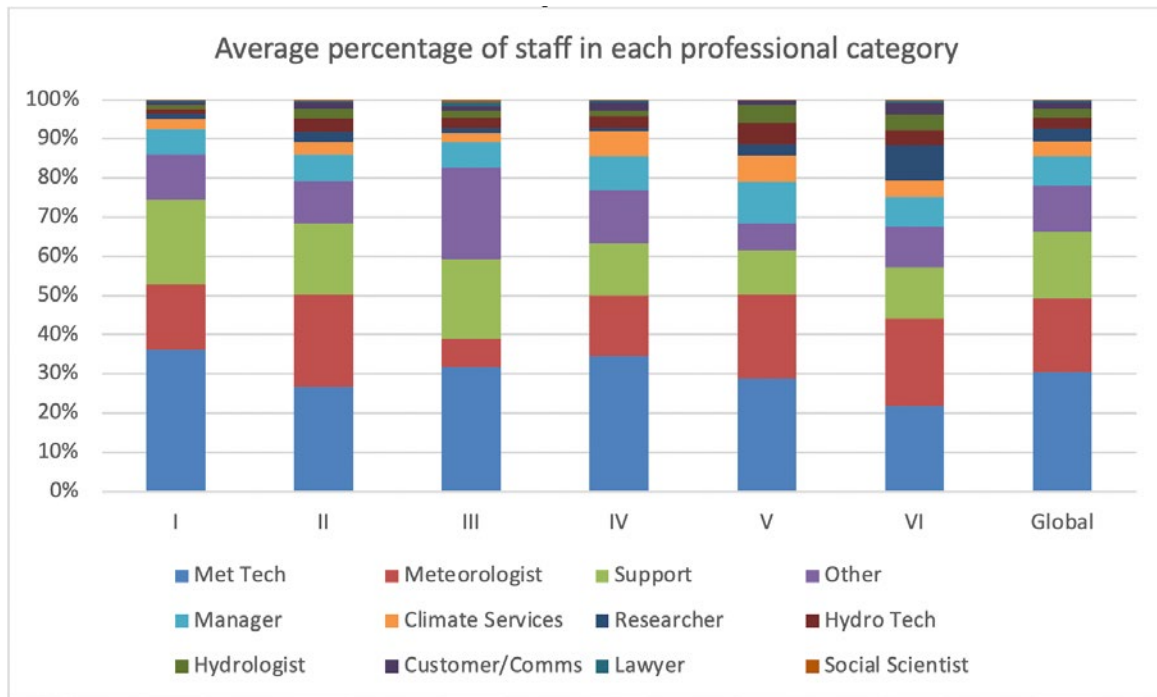
**Table 12. Total number of NMHS staff working in each professional category at the time of the survey, globally and by region, according to the survey respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech	4 833	15 245	1 020	526	1 687	3 248	26 559
Meteorologist	2 155	13 665	327	598	2 705	2 954	22 404
Support	2 902	9 110	563	345	654	2 013	15 587
Manager	483	8 450	182	333	793	737	10 978
Other	1 227	4 949	1 142	639	1 269	1 724	10 950
Custom/Comms	96	7 621	51	14	237	568	8 587
Researcher	254	1 518	52	68	219	1 703	3 814
Social Scientist	6	2 580	18	20	52	132	2 808
Climate	227	547	65	131	750	531	2 251
Hydro Tech	77	105	50	208	15	337	792
Hydrologist	89	79	85	69	71	360	753
Lawyer	44	33	32	5	5	58	177
Totals	12 393	63 902	3 586	2 956	8 457	14 365	105 659

**Table 13. Percentage of NMHS staff working in each professional category at the time of the survey, globally and by region, according to the survey respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech	36%	27%	31%	34%	29%	22%	31%
Meteorologist	17%	23%	7%	16%	21%	22%	19%
Support	22%	18%	21%	13%	11%	13%	17%
Other	12%	11%	23%	14%	7%	10%	12%
Manager	6%	7%	7%	9%	11%	8%	7%
Climate Services	3%	3%	2%	6%	7%	4%	4%
Researcher	1%	3%	1%	1%	3%	9%	3%
Hydro Tech	1%	3%	2%	3%	5%	4%	3%
Hydrologist	1%	2%	2%	1%	4%	4%	2%
Customer/Comms	1%	2%	1%	2%	1%	3%	2%
Lawyer	0%	0%	1%	0%	0%	1%	0%
Social Scientist	0%	0%	1%	0%	0%	0%	0%
Total percentage	100%	100%	100%	100%	100%	100%	100%

Figure 10 also shows the percentage of NMHS staff working in each professional category at the time of the survey, globally and by region, according to the survey respondents.



**Figure 10. Percentage of NMHS staff working in each professional category at the time of the survey, globally and by region, according to the survey respondents**

Tables 12 and 13 and Figure 10 show that the responding Members reported professional category information for 105 659 of the 118 128 staff members that were reported overall, or 89% of the total number of staff members.

The size of regional NMHS workforces varied from about 3 600 in Region III to about 64 000 in Region II. Region IV respondents reported having about 3 000 NMHS staff members working in the various professional fields, Region V respondents reported having about 8 500, Region I respondents reported having about 12 400, and Region VI respondents reported having about 14 400.

Globally, the most numerous professional group was Meteorological Technicians (about 26 600 people, averaging 31% of each NMHS's staff), followed by Meteorologists (about 22 000 people, averaging 19% of each NMHS's staff). These two groups together represented half of all NMHS staff worldwide at the time of the survey according to the respondents.

Members also reported having 15 600 Support Staff (on average, 17% of each NMHS's total staff), 11 000 Managers (on average, 7% of each NMHS's total staff), and 11 000 Other Staff (staff members working in professional fields not covered by the survey) (on average, 12% of each NMHS's total staff).

These five professional categories (Meteorological Technicians, Meteorologists, Support Staff, Other Staff, and Managers) constituted 86% of all NMHS staff worldwide.

The respondents reported that about 3 800 Researchers and about 2 250 Climatologists were working in NMHSs across the globe at the time of the survey (averaging, respectively, 3% and 4% of each NMHS's total staff). The respondents also reported that a total of 763 Hydrologists and 836 Hydrology Technicians were working in NMHSs worldwide. Hydrologists and Hydrological Technicians were both, on average, 2% to 3% of each NMHS's staff.

For the three new professional categories introduced in the 2021 survey, Customer Interactions and Communications Staff, Social Scientists, and Lawyers, the respondents reported that the total numbers of staff members across all NMHSs were about 8 600, 2 800 and 178, respectively. Customer Interactions and Communications Staff were, on average, 2% of each NMHS's staff. Social Scientists and Lawyers were both, on average, less than 1% of each NMHS's staff.

Table 14 shows the percentage of NMHS staff represented by each category in 2017.

**Table 14. Percentage of NMHS staff working in each professional category, globally and by region in 2017, according to the survey respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech	33%	30%	31%	40%	43%	22%	32%
Meteorologist	16%	25%	13%	15%	17%	22%	19%
Support	23%	15%	25%	10%	14%	16%	17%
Other	7%	6%	11%	7%	8%	12%	8%
Manager	8%	8%	8%	10%	9%	7%	8%
Climate Services	7%	5%	3%	12%	7%	5%	6%
Researcher	3%	4%	3%	1%	2%	8%	4%
Hydro Tech	2%	6%	4%	4%	1%	4%	3%
Hydrologist	2%	2%	3%	2%	0%	4%	2%
Total percentage	100%	100%	100%	100%	100%	100%	100%

Table 14, compared to Table 13, shows that the percentage of NMHS staff in each category in 2021, in general, remained consistent with the corresponding percentages in 2017.

One exception was Other Staff, which was a larger average percentage of staff in 2021 (12% of the global average) than in 2017 (8% of the global average). The percentage of staff represented by Other Staff increased in every region from 2017 to 2021, but particularly in Regions I, II, III, and IV, where it doubled.

Another exception was Climate Services Staff, which was a smaller average percentage of staff in 2021 (4% of the global average) than in 2017 (6% of the global average). The percentage of staff comprised by Climate Services Staff decreased in all regions from 2017 to 2021 except for Region V, where it remained constant. The percentage decreased particularly in Regions I, II, and IV, where it decreased by half.

Given that Climate Services was one of the top two training priorities in 2021 worldwide and for five of the six regions, this decrease in the percentage of Climate Services Staff was an unexpected result.

### **Maps of the percentages of NMHS staff that were Meteorological Technicians, Meteorologists, and Climate Services Staff at the time of the survey according to the respondents**

The maps on the following pages show the percentages of the respondents' NMHS staff that were Meteorological Technicians, Meteorologists, and Climate Services Staff at the time of the survey according to the respondents.

Map 3 shows the percentage of the respondents' NMHS staff that were Meteorological Technicians.

Map 4 shows the percentage of the respondents' NMHS staff that were Meteorologists.

Map 5 shows the percentage of the respondents' NMHS staff that were Climate Services Staff.

The maps are coloured on a gradient from pale blue to dark blue.

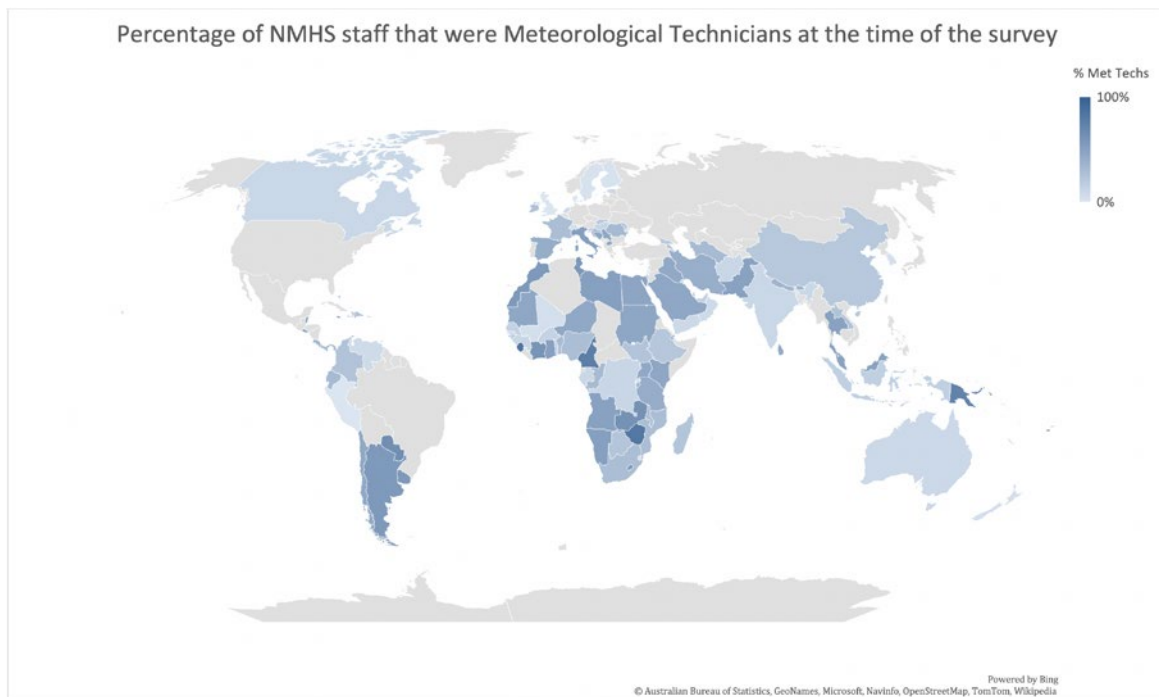
- The map locations where the percentages of NMHS staff in these professional categories were the lowest are shaded pale blue.
  - The lowest percentage of NMHS staff in all three professional categories was 0%.



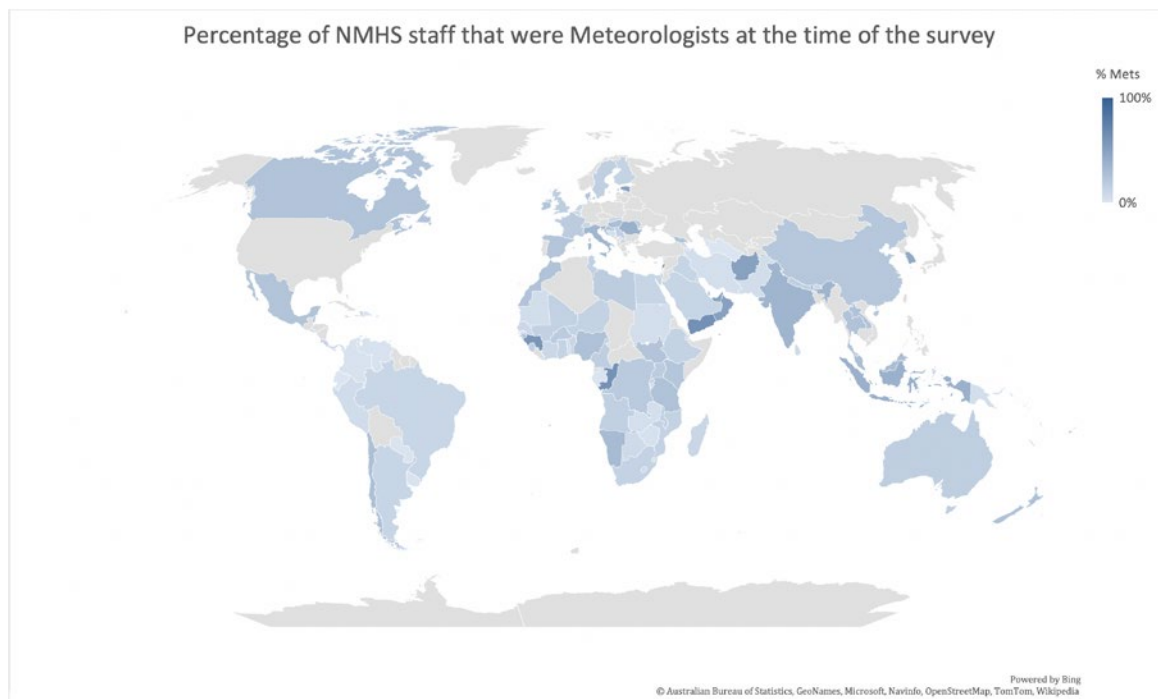
- The map locations where the percentages of NMHS staff in these professional categories were the highest are shaded dark blue.
  - The highest percentage of NMHS staff represented by Meteorological Technicians was 83%.
  - The highest percentage of NMHS staff represented by Meteorologists was 67%.
  - The highest percentage of NMHS staff represented by Climate Services Staff was 37%.
- Members whose NMHSs had percentages of staff in these categories that were between the highest and lowest percentages are shaded in gradually changing hues of blue.
- Members that did not share information on this topic or that did not respond to the survey are shaded pale grey.

Maps 3 and 4 show that regional Members varied substantially on the percentages of their total staff that were Meteorological Technicians and Meteorologists.

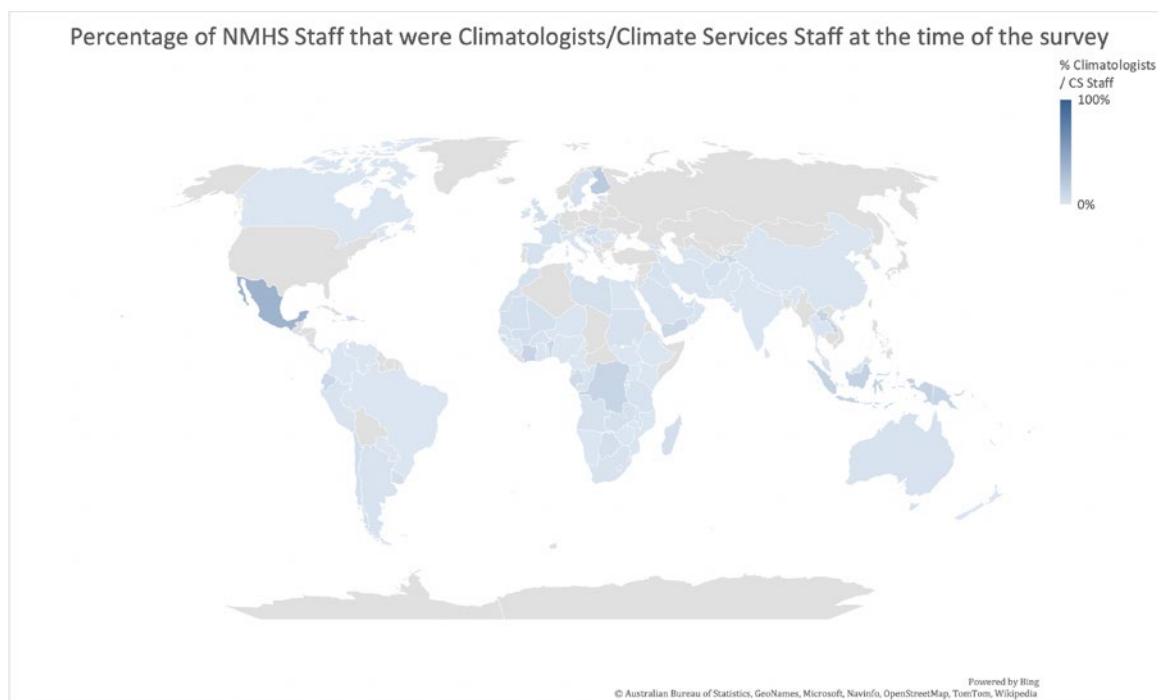
Map 5 shows that while most Members had only a small percentage of staff that were Climate Services Staff, some Members had substantial percentages of their total staff that worked in this area.



**Map 3. Percentage of NMHS staff that were Meteorological Technicians at the time of the survey**



**Map 4. Percentage of NMHS staff that were Meteorologists at the time of the survey**



**Map 5. Percentage of NMHS staff that were Climatologists/Climate Services Staff at the time of the survey**

#### 2.1.2.2 Gender balance in the professional categories

##### Major findings

- It is somewhat uncommon for there to be a gender balance within any of the professional categories at individual NMHSs.

- For seven of the twelve professional categories listed in the 2021 survey, the majority of the respondents reported that in their NMHSs, women were either moderately or substantially underrepresented. These categories were:

- Manager
- Meteorological Technician
- Hydrological Technician
- Meteorologist
- Researcher
- Other Staff
- Hydrologist

In particular, women were substantially underrepresented as Managers in almost half of the respondents' NMHSs.

- For the remaining five professional categories, the underrepresentation of women was less widespread, although gender-balanced staffing was still uncommon. In these categories, fewer than half of the respondents had NMHS staffs that underrepresented women; however, about 20% to 30% of the respondents still had staffing patterns that substantially underrepresented women in all five categories. These categories were:

- Support Staff
- Climatologist
- Customer Interactions and Communications Staff
- Social Scientist
- Lawyer

- The regions varied in their patterns of gender representation within the professional categories.

### Detailed results

More insight into the gender distribution within NMHSs around the world can be gained by looking at the numbers of men and women that were working in each of the above professional categories at the time of the 2021 survey.

As mentioned at the beginning of Section 2.1.2.1, of the 139 Members that responded to the survey in 2021, 136 provided information about the numbers of men and women that were working in these professional categories in their NMHSs.

Table 15 shows the number of men and women working in NMHSs in each professional category at the time of the survey, globally and by region, according to the respondents.

**Table 15. Number of men and women working in NMHSs in each professional category at the time of the survey, globally and by region, according to the respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech – Female	1 020	5 880	357	182	420	944	8 803
Met Tech – Male	3 813	9 365	662	344	1 267	2 304	17 755
Meteorologist – Female	481	7 039	128	215	1 085	1 122	10 070
Meteorologist – Male	1 674	6 626	199	383	1 620	1 832	12 334
Support – Female	1 122	4 215	280	213	405	793	7 028
Support – Male	1 780	4 895	282	132	249	1 220	8 558
Other – Female	282	1 169	475	259	472	597	3 254
Other – Male	945	3 780	667	380	797	1 127	7 696
Manager – Female	123	3 003	59	110	228	254	3 777

Professional category	Region						Global
	I	II	III	IV	V	VI	
Manager – Male	360	5 447	123	223	565	483	7 201
Customer/Comms – Female	44	4 269	34	8	161	272	4 788
Customer/Comms – Male	52	3 352	17	6	76	296	3 799
Researcher – Female	66	741	27	14	60	662	1 570
Researcher – Male	188	777	25	54	159	1 041	2 244
Social Scientist – Female	1	1 705	14	9	15	91	1 835
Social Scientist – Male	5	875	4	11	37	41	973
Climate – Female	85	314	39	40	347	239	1 064
Climate – Male	142	233	26	91	403	292	1 187
Hydro Tech – Female	30	11	12	41	2	143	239
Hydro Tech – Male	47	94	37	167	13	194	552
Hydrologist – Female	31	13	23	23	26	175	291
Hydrologist – Male	58	66	63	46	45	185	463
Lawyer – Female	21	17	16	3	3	35	95
Lawyer – Male	23	16	16	2	2	23	82
Total – Women	3 306	28 376	1 465	1 117	3 224	5 327	42 815
Total – Men	9 087	35 526	2 121	1 839	5 233	9 038	62 844
Total – All staff	12 393	63 902	3 586	2 956	8 457	14 365	105 659

Table 15 shows that for the 105 659 NMHS staff members for whom the respondents provided professional category information, 42 815 (40%) were women and 62 844 (60%) were men.

Table 15 also shows that in every region, there was at least one man and one woman employed in each of the professional fields.

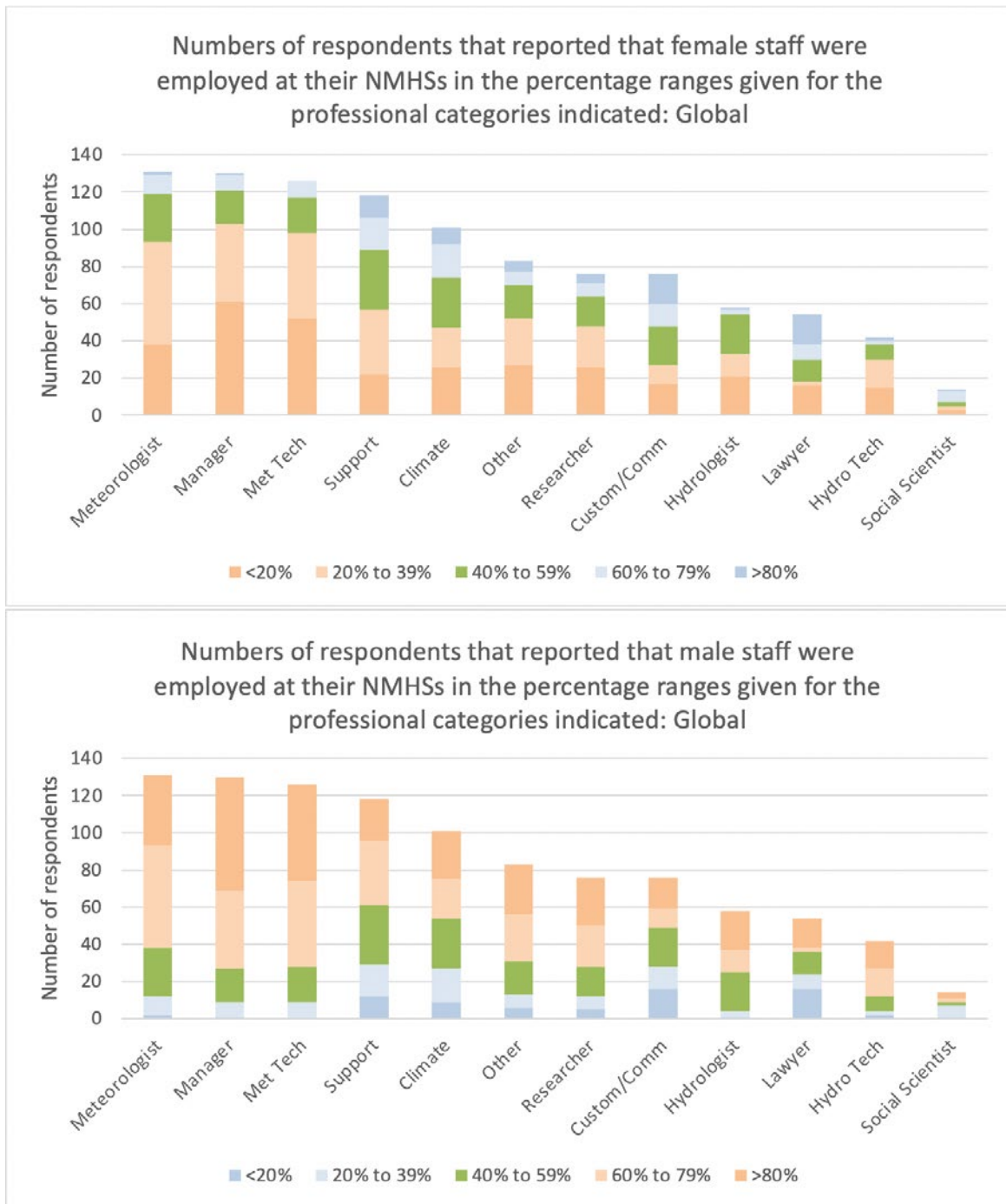
According to the respondents, the total number of NMHS staff was in the thousands for a number of professional categories. These included Meteorological Technicians, Meteorologists, Support Staff, Other Staff, Managers, Customer Interactions and Communications Staff, and Social Scientists.

There were three professional categories for which the global totals of female staff outnumbered those of male staff: Customer Interactions and Communications Staff, Social Scientists, and Lawyers.

There were five professional categories for which some of the regional totals of female staff outnumbered those of male staff: Support Staff, Customer Interactions and Communications Staff, Researchers, Social Scientists, Climatologists, and Lawyers.

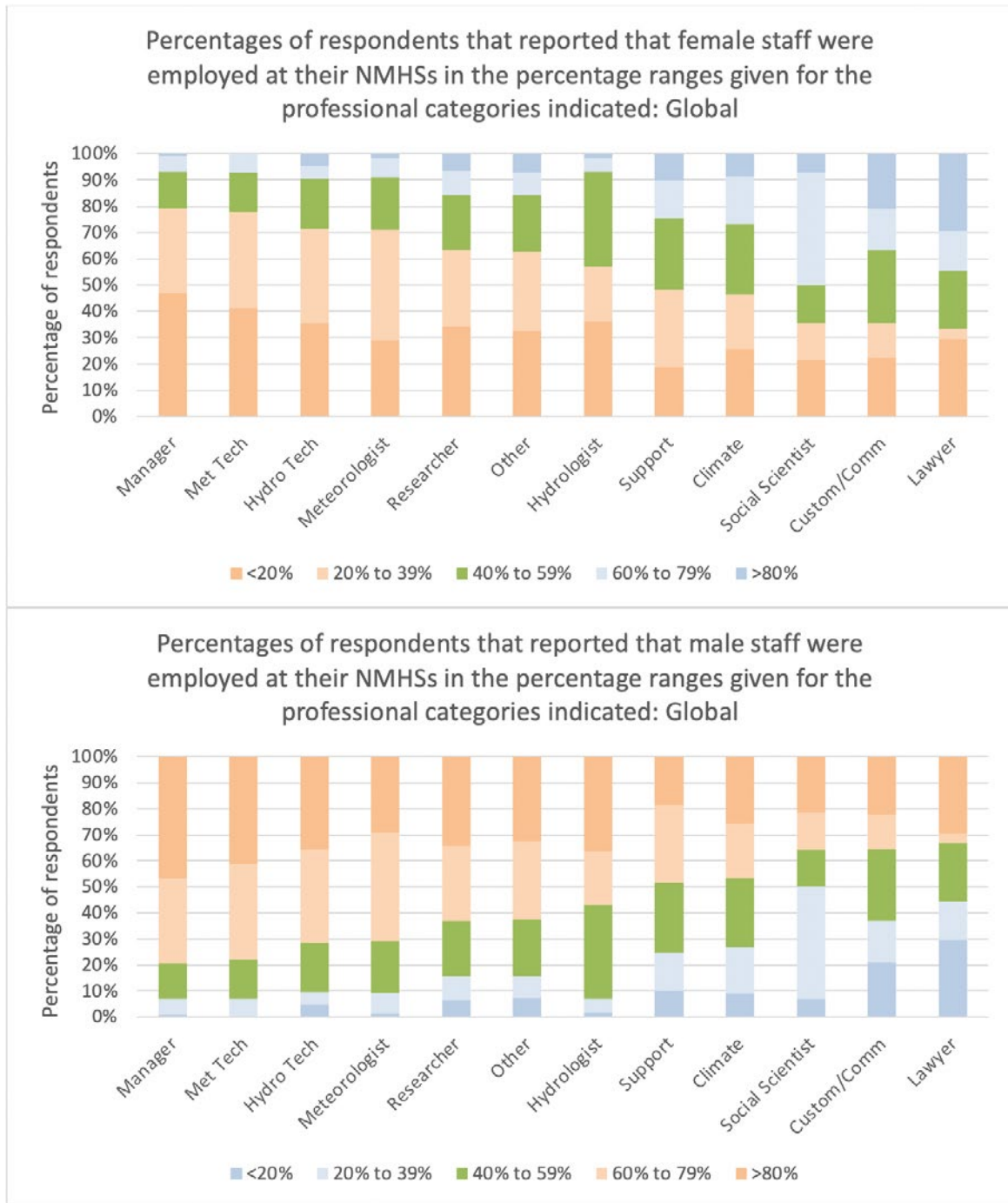
## Global

Figure 11 shows the numbers of respondents globally that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 11. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Global**

Figure 12 shows the percentages of respondents globally that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the two classifications for the underrepresentation of women (the two orange bars) added together.



**Figure 12. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Global**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

The percentages of respondents shown in Figure 12 were calculated based on the total number of respondents that shared information about each professional category. For instance, 14 respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number 14 and total 100%.

Figure 12 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange segments considered together).

Figures 11 and 12 show that for the twelve professional categories, the respondents' NMHSs had a variety of gender distributions.

For all of the professional categories, the staffs of some NMHSs were gender balanced (see the green segments of each bar); the staffs of some NMHSs moderately or substantially underrepresented women (see the orange segments of each bar); and the staffs of some NMHSs overrepresented women (see the blue segments of each bar).

For most of the professional categories, there was at least one respondent with each gender distribution classification. The exception was the professional category of Meteorological Technician; there were no respondents whose NMHS had 80% or more women and 20% or fewer men in this category.

Gender-balanced staffing in any of the professions is somewhat uncommon. This is illustrated by the narrowness of the green segments relative to the orange and blue segments.

For most of the professional categories, 14% to 18% of the respondents' NMHS staffs were gender balanced. The exception was the professional category of Hydrologist; in this category, 36% of the respondents' NMHS staffs were gender balanced.

For seven of the twelve professional categories, the majority of the respondents reported that in their NMHSs, women were either moderately or substantially underrepresented. These categories were:

- Manager
- Meteorological Technician
- Hydrological Technician
- Meteorologist
- Researcher
- Other Staff
- Hydrologist

In particular, women were substantially underrepresented as Managers in almost half of the respondents' NMHSs.

For the remaining five professional categories, the underrepresentation of women was less widespread, although gender-balanced staffing was still uncommon. In these categories, fewer than half of the respondents had NMHS staffs that underrepresented women; however, about 20% to 30% of the respondents still had staffing patterns that substantially underrepresented women in all five of these categories. These categories were:

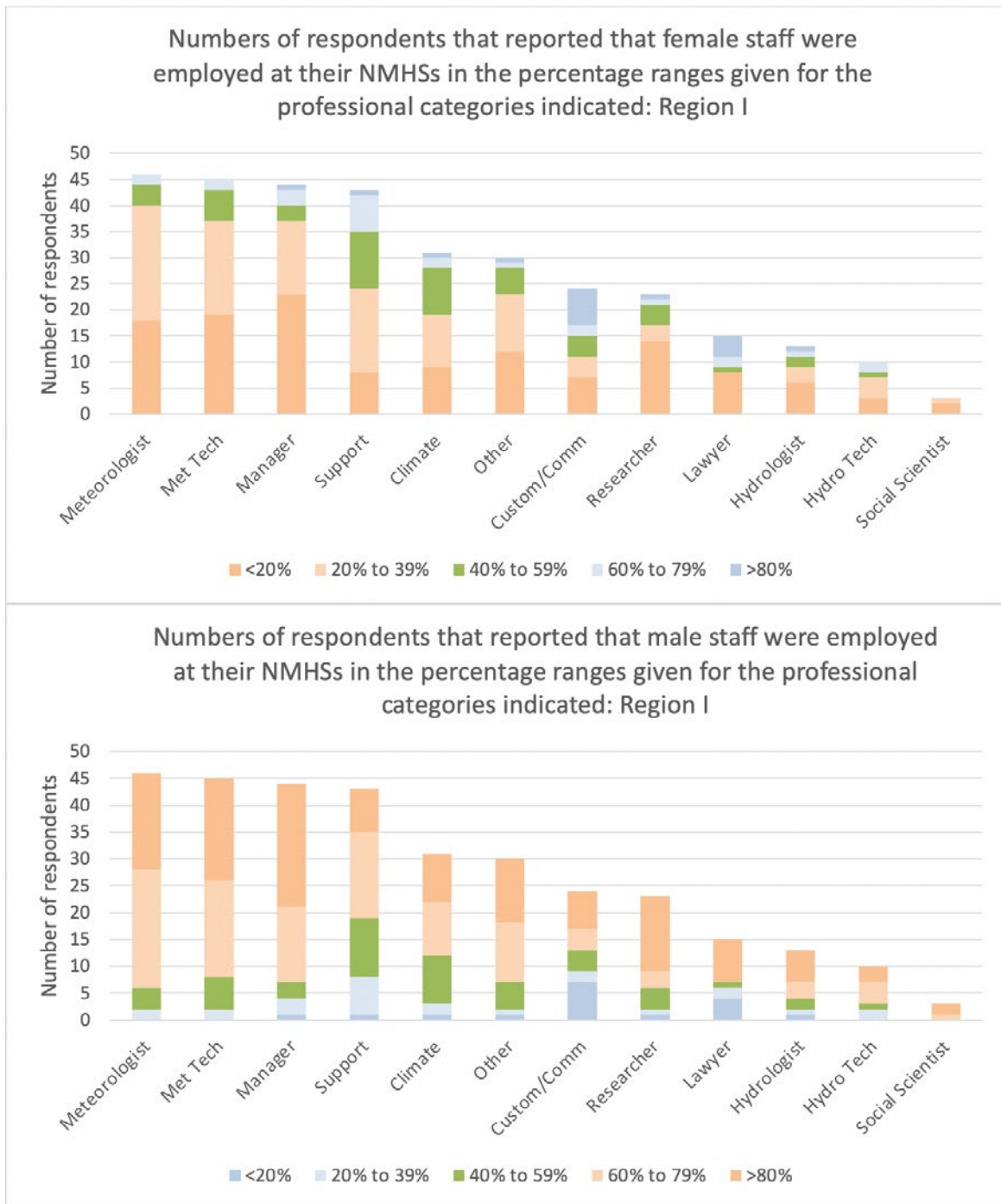
- Support Staff

- Climatologist
- Customer Interactions and Communications Staff
- Social Scientist
- Lawyer

### **Region I**

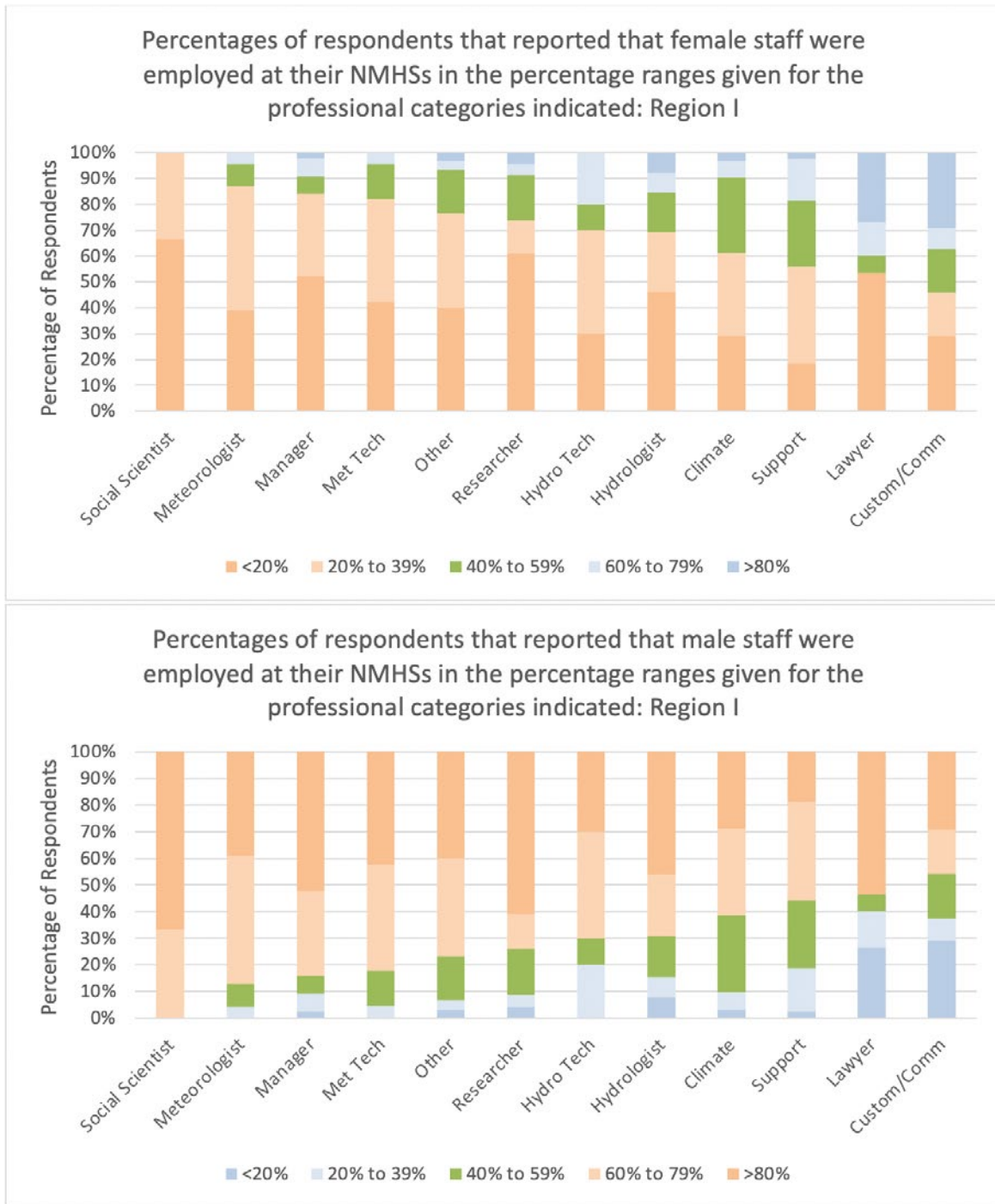
Figure 13 shows the numbers of Region I respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.





**Figure 13. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region I**

Figure 14 shows the percentages of Region I respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges for the professional categories indicated. The chart is sorted by the two classifications for the underrepresentation of women (the two orange bars) added together.



**Figure 14. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region I**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

The percentages of respondents shown in Figure 14 were calculated based on the total number of respondents who shared information about each professional category. For instance, three respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three and total 100%.

Figure 14 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 14 shows that for the twelve professional categories, the respondents NMHSs had a variety of gender distributions.

Gender-balanced staffing in any of the professions is uncommon. This is illustrated by the narrowness of the green segments relative to the orange and blue segments.

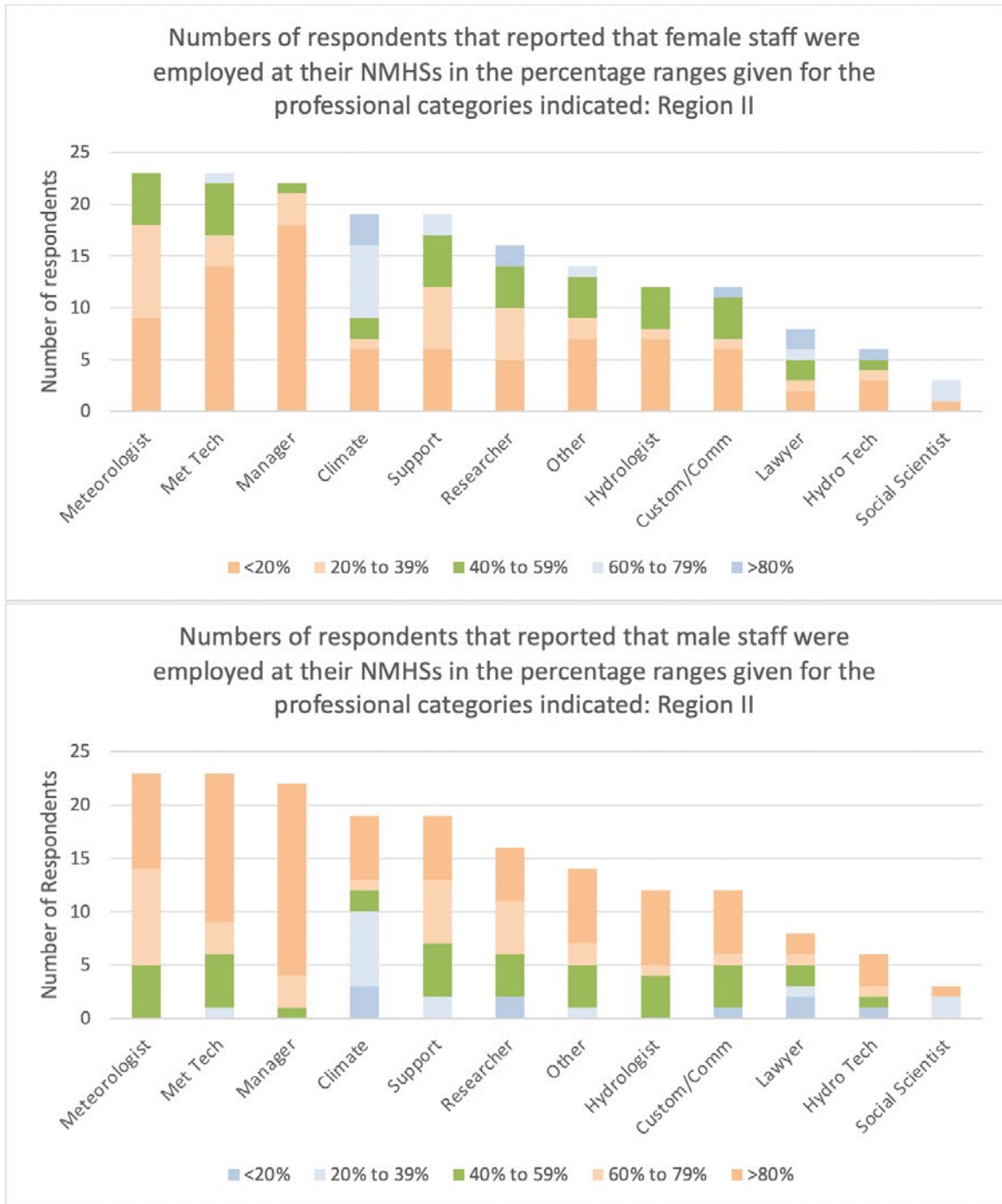
The staffs of the NMHSs were gender balanced in 0% to 29% of the professional categories according to the survey respondents.

For all of the professional categories except Customer Interactions and Communications Staff, the majority of the respondents' NMHSs had staffs that underrepresented women either moderately or substantially.

For the professional category of Customer Interactions and Communications Staff, 46% of the respondents' NMHSs had staffs that underrepresented women either moderately or substantially.

## **Region II**

Figure 15 shows the numbers of Region II respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 15. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region II**

Figure 16 shows the percentages of Region II respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the two classifications for underrepresentation of women (the two orange bars) added together.



**Figure 16. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region II**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

The percentages of respondents shown in Figure 16 were calculated based on the total number of respondents that shared information about each professional category. For instance, three respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three and total 100%.

Figure 16 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 16 shows that for the twelve professional categories, the respondents' NMHSs had a variety of gender distributions.

Gender-balanced staffing in any of the professions is uncommon. This is illustrated by the narrowness of the green segments relative to the orange and blue segments.

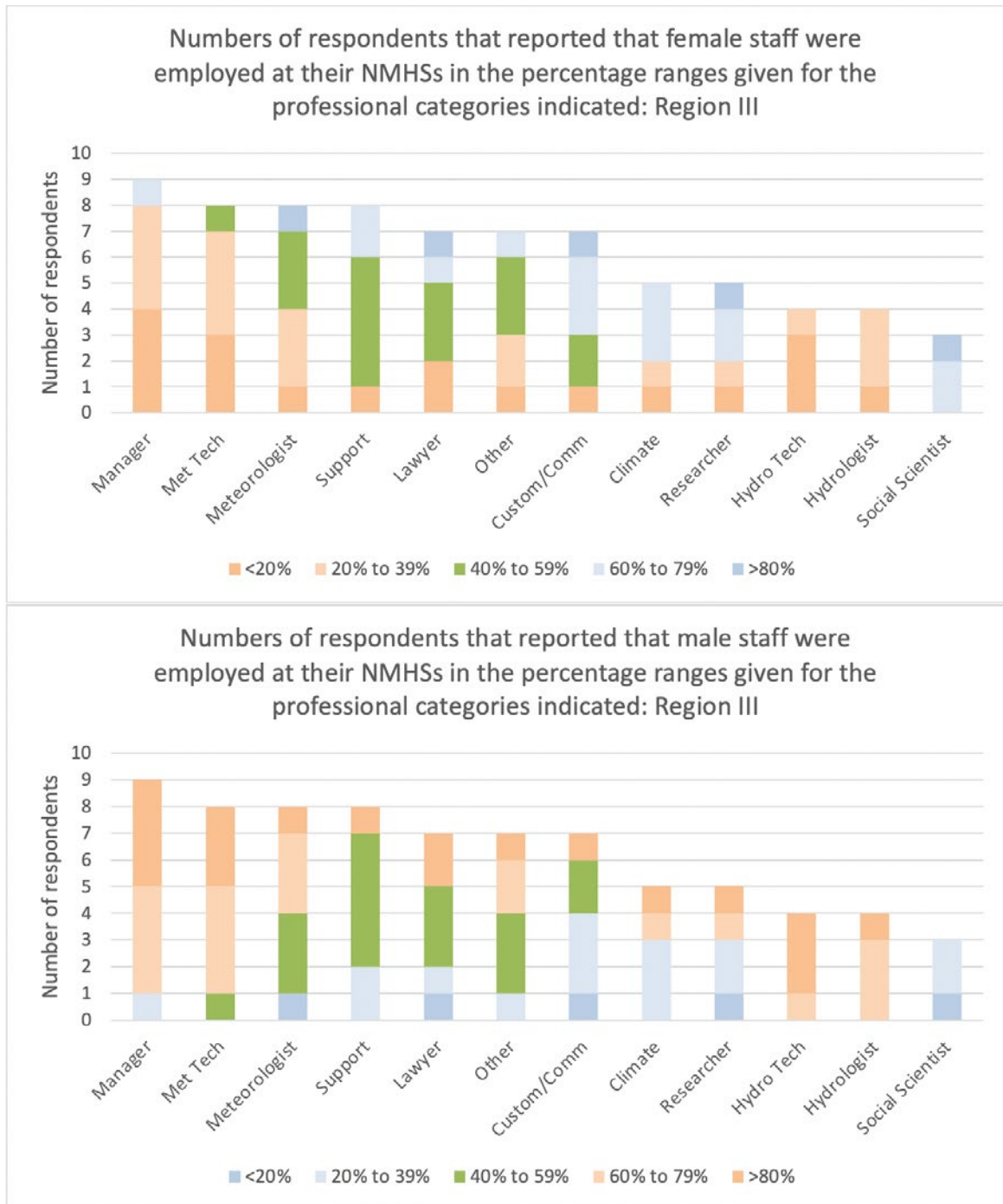
The staffs of the NMHSs were gender balanced in 0% to 33% of the professional categories according to the survey respondents.

For nine of the professional categories, the majority of the respondents' NMHSs had staffs that underrepresented women, either moderately or substantially.

The three categories in which women were not underrepresented were Lawyer, Climatologist, and Social Scientist.

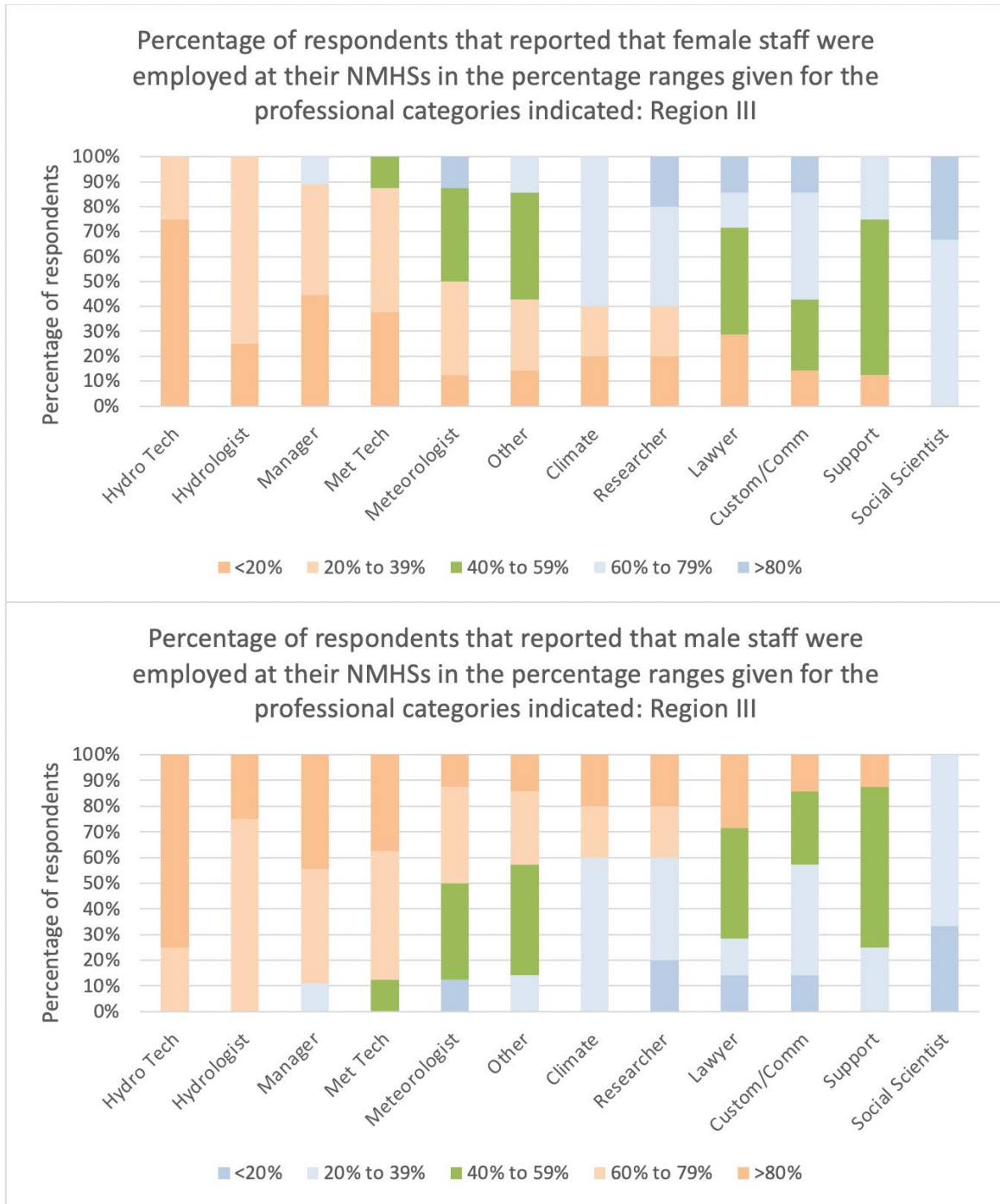
### **Region III**

Figure 17 shows the numbers of Region III respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 17. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region III**

Figure 18 shows the percentages of Region I respondents that employ various percentages of female staff and male staff, by professional category, for the respondents that shared information. The chart is sorted by the two categories for underrepresentation of women (the two orange bars) added together.



**Figure 18. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region III**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).



The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more ).

The percentages of respondents shown in Figure 18 were calculated based on the total number of respondents that shared this information about each professional category. For instance, three respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three respondents and total 100%.

Figure 18 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 18 shows that for the twelve professional categories, the respondents' NMHSs had a variety of gender distributions.

There were six professional categories for which no NMHSs had gender-balanced staffs. (See the professions whose bars have no green segments.)

There were three professional categories (Meteorologist, Other, and Lawyer) for which at least 40% of NMHSs had gender-balanced staffs.

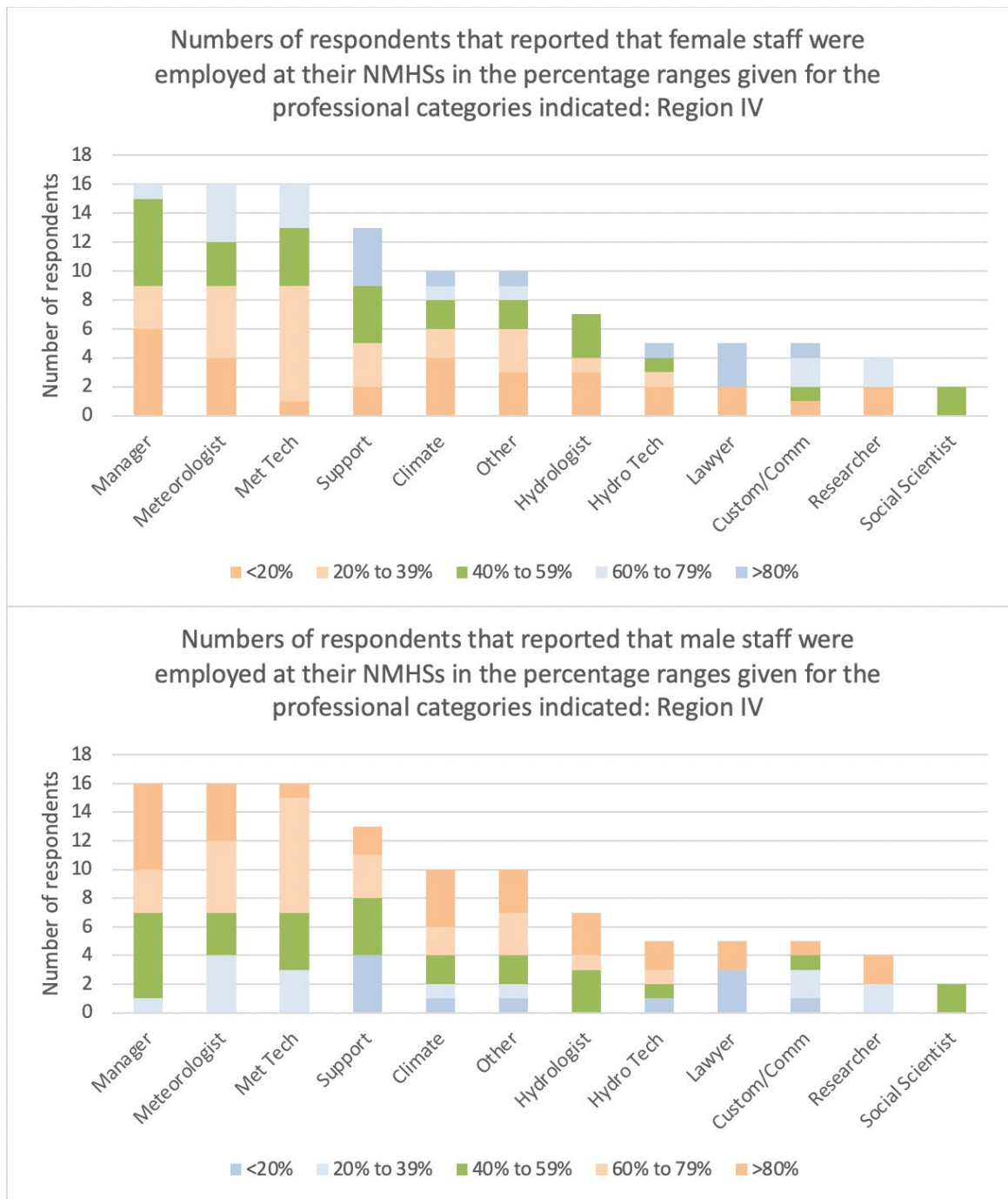
There was one professional category, Support Staff, for which more than 60% of NMHSs had gender-balanced staffs.

For four professional categories (Hydro Technician, Hydrologist, Manager, and Met Technician), the majority of the respondents' NMHSs had staffs that underrepresented women, either moderately or substantially.

For four other professional categories (Climate Services, Researcher, Customer Interactions and Communications, and Social Scientist), the majority of the respondents' NMHSs had staffs that overrepresented women.

## **Region IV**

Figure 19 shows the numbers of Region IV respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 19. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region IV**

Figure 20 shows the percentages of Region IV respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the two classifications for the underrepresentation of women (the two orange bars) added together.



**Figure 20. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region IV**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

The percentages of the respondents shown in Figure 20 were calculated based on the total number of respondents that shared information about each professional category. For instance, three respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three and total 100%.

Figure 20 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 20 shows that for the twelve professional categories, the respondents' NMHSs had a variety of gender distributions.

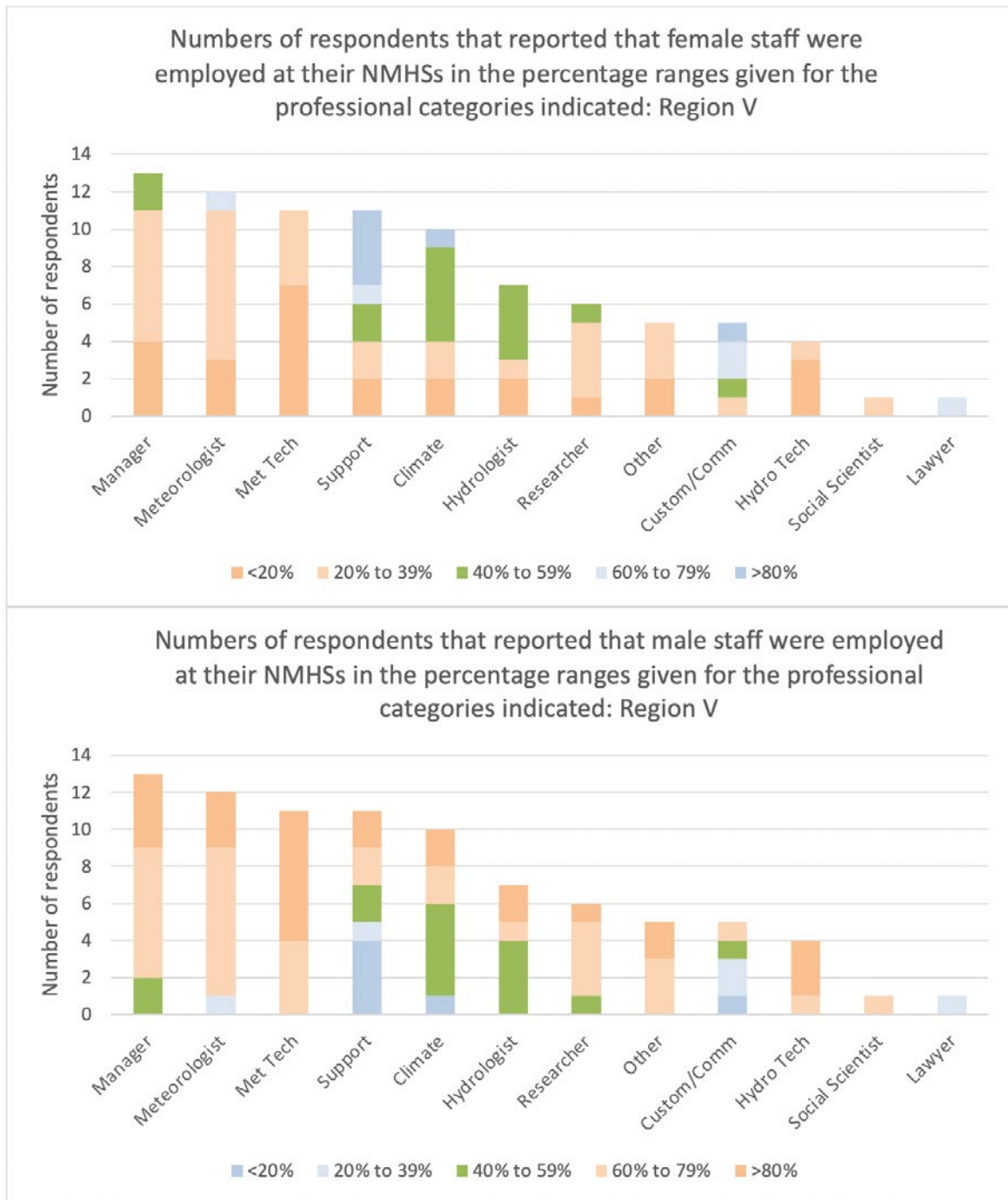
Gender-balanced staffing in any of the professions is somewhat uncommon. This is illustrated by the narrowness of the green segments relative to the orange and blue segments.

For most of the professional categories, 0% to 43% of the respondents' NMHS staffs were gender balanced. The exception was the professional category of Social Scientist. In this category, 100% of the respondents' NMHS staffs were gender balanced; however, this figure represents only two respondents.

For seven of the twelve professional categories, the majority of the respondents reported that in their NMHSs, women were either moderately or substantially underrepresented.

## **Region V**

Figure 21 shows the numbers of Region V respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 21. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region V**

Figure 22 shows the percentage of Region V respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the two classifications for the underrepresentation of women (the two orange bars) added together.



**Figure 22. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region V**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more of the staff was female and less than 20% of the staff was male).

The percentages of respondents shown in Figure 22 were calculated based on the total number of respondents that shared information about each professional category. For instance, three respondents shared information about the numbers of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three and total 100%.

Figure 22 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 22 shows that for the twelve professional categories, the respondents' NMHSs had a variety of gender distributions.

There were six professional categories for which no NMHSs had gender-balanced staffs. (See the professions whose bars have no green segments.)

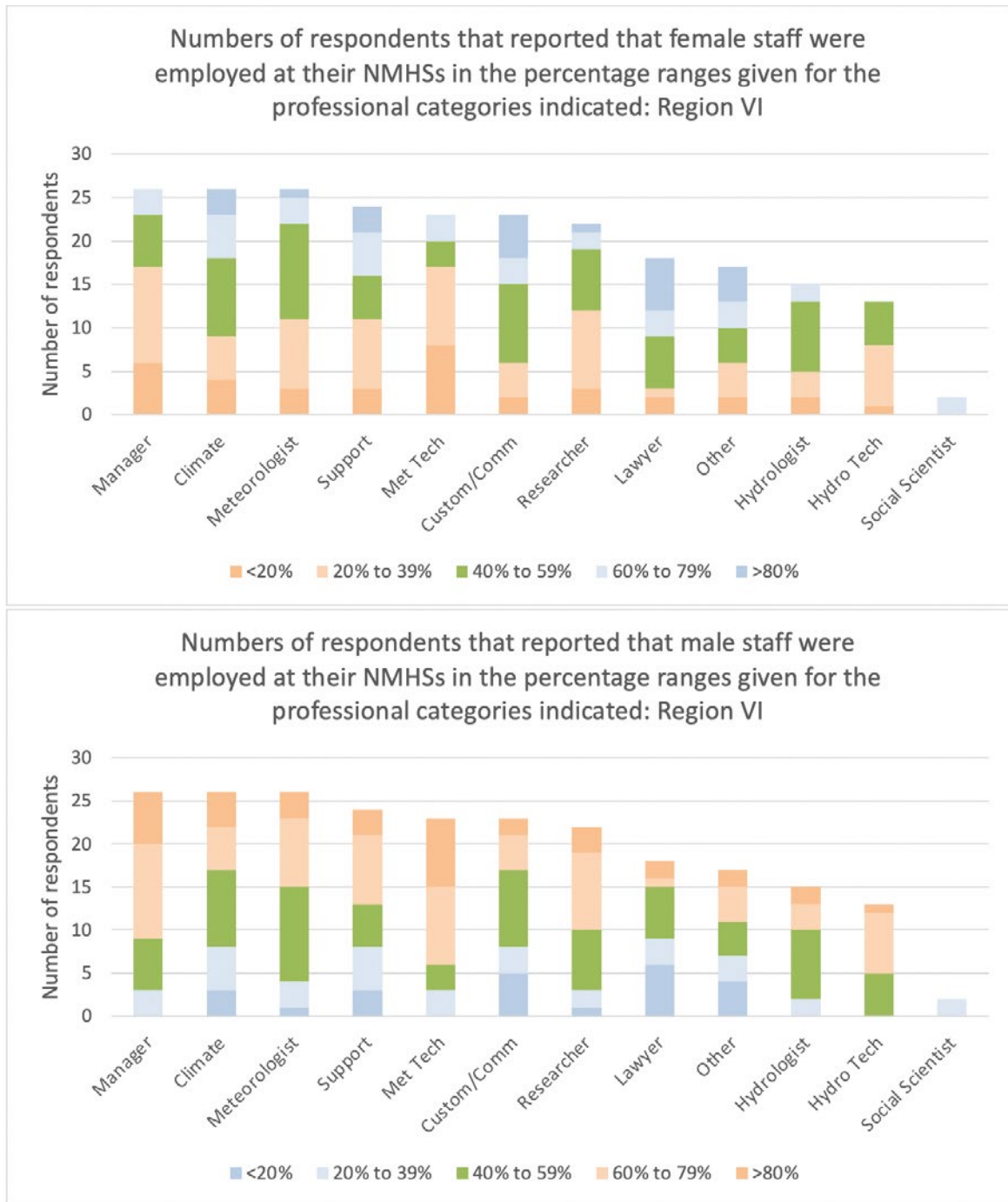
There were two professional categories (Climate Services and Hydrologist) for which at least 50% of NMHSs had gender-balanced staffs

For seven professional categories, the majority of the respondents' NMHSs had staffs that underrepresented women, either moderately or substantially.

It is important to note that only one respondent had NMHS staff members in the categories of Social Scientist and Lawyer.

## **Region VI**

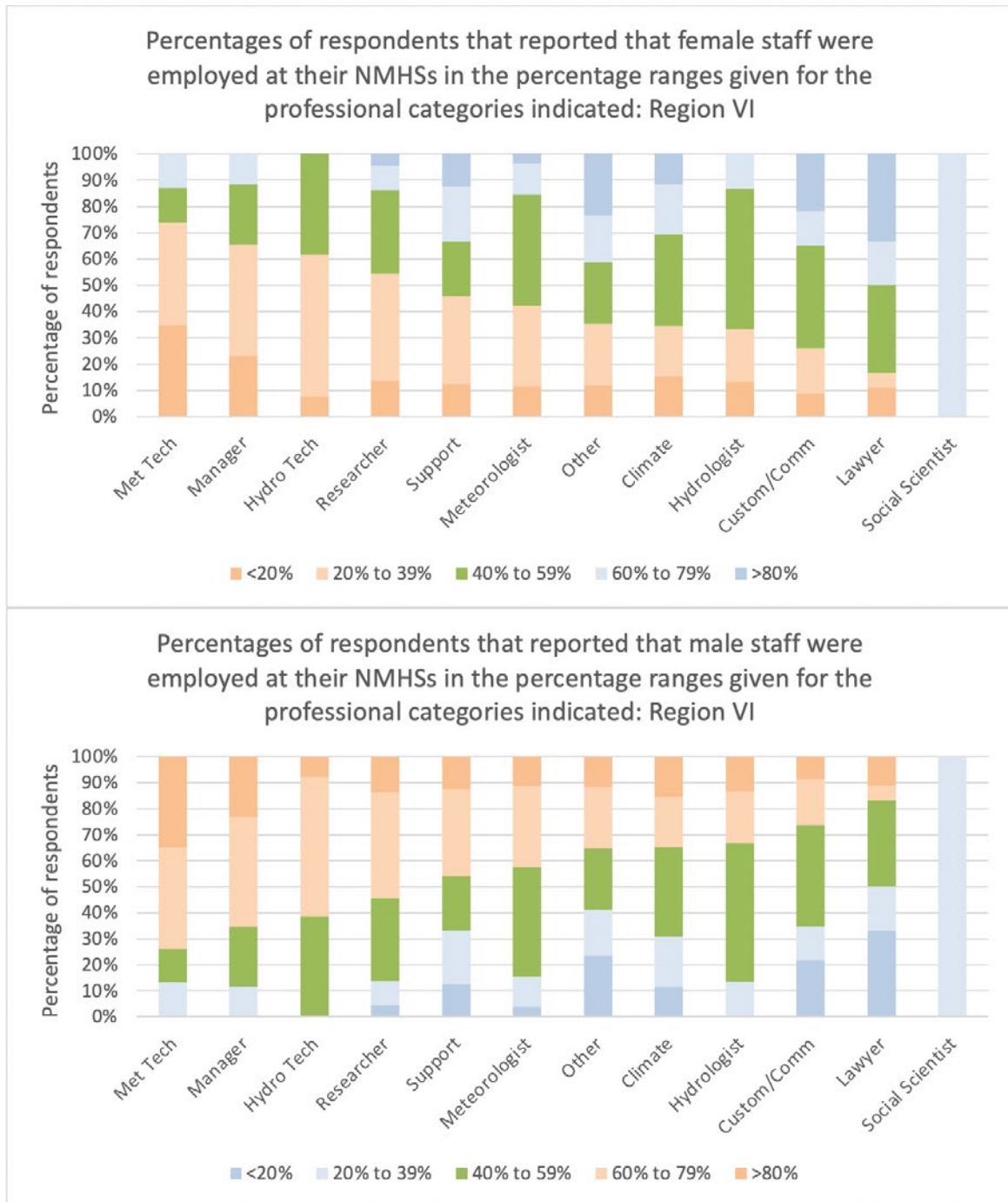
Figure 23 shows the numbers of Region VI respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the number of respondents that shared information about each category.



**Figure 23. Numbers of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region VI**

Figure 24 shows the percentages of Region VI respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated. The chart is sorted by the two classifications for the underrepresentation of women (the two orange bars) added together.





**Figure 24. Percentages of respondents that reported that female and male staff were employed at their NMHSs in the percentage ranges given for the professional categories indicated: Region VI**

The dark orange segments of each bar show the number or percentage of NMHSs in which women were substantially underrepresented (less than 20% of the staff was female and 80% or more of the staff was male).

The light orange segments of each bar show the number or percentage of NMHSs in which women were moderately underrepresented (20% to 39% of the staff was female and 60% to 79% of the staff was male).

The green segments of each bar show the number or percentage of NMHSs whose staff was gender balanced according to the definition of “gender balance” used in this report (40% to 59% of the staff was female and 40% to 59% of the staff was male).

The pale blue segments show the number or percentage of NMHSs in which women were moderately overrepresented (60% to 79% of the staff was female and 20% to 39% of the staff was male).

The medium blue segments show the number or percentage of NMHSs in which women were substantially overrepresented (80% or more female staff, and which employ less than 20% male staff).

The percentages of respondents shown in Figure 24 were calculated based on the total number of respondents that shared information about each professional category. For instance, three respondents shared information about the number of Social Scientists employed at their NMHSs, so the percentages of respondents that fit into each percentage range relating to the gender distribution of Social Scientists were calculated based on the number three and total 100%.

Figure 24 sorts the professional categories from left to right by the percentage of respondents whose NMHS staffs underrepresented women, either moderately or substantially (both orange bars considered together).

Figure 24 shows that for the twelve professional categories, the respondents NMHSs had a variety of gender distributions. For many of the professional categories, there was at least one respondent with each gender distribution classification.

For most of the professional categories from 13% to 53% of the respondents' NMHS staffs were gender balanced. The exception was the professional category of Social Scientist; however, only two respondents had NMHS staff members in this category.

A majority of respondents (53%) had gender-balanced staffs in the professional category of Hydrologist.

For four professional categories (Meteorological Technician, Manager, Hydrological Technician, and Researcher), the majority of the respondents NMHSs had staffs that underrepresented women, either moderately or substantially.

### **Maps of the percentages of female Meteorological Technicians and Meteorologists in Members' NMHSs**

Map 6 shows the percentages of female Meteorological Technicians in Members' NMHSs as reported by the 2021 survey respondents. The map is coloured on a gradient from very pale blue to dark blue.

The Members whose NMHSs had the lowest percentages of female Meteorological Technicians are shaded very pale blue. The lowest percentage according to the 2021 survey respondents was 0%.

The Members whose NMHSs had the highest percentages of female Meteorological Technicians are shaded dark blue. The highest percentage according to the 2021 survey respondents was 79%.

The Members whose NMHSs had a staff of Meteorological Technicians that was between 0% and 79% female are coloured in gradually changing hues of blue.

The Members whose survey respondents did not share information on this topic or that did not respond to the survey are shaded pale grey.

Map 7 shows the percentages of female Meteorologists in Members' NMHSs as reported by the 2021 survey respondents. The map is coloured on a gradient from very pale blue to dark blue.

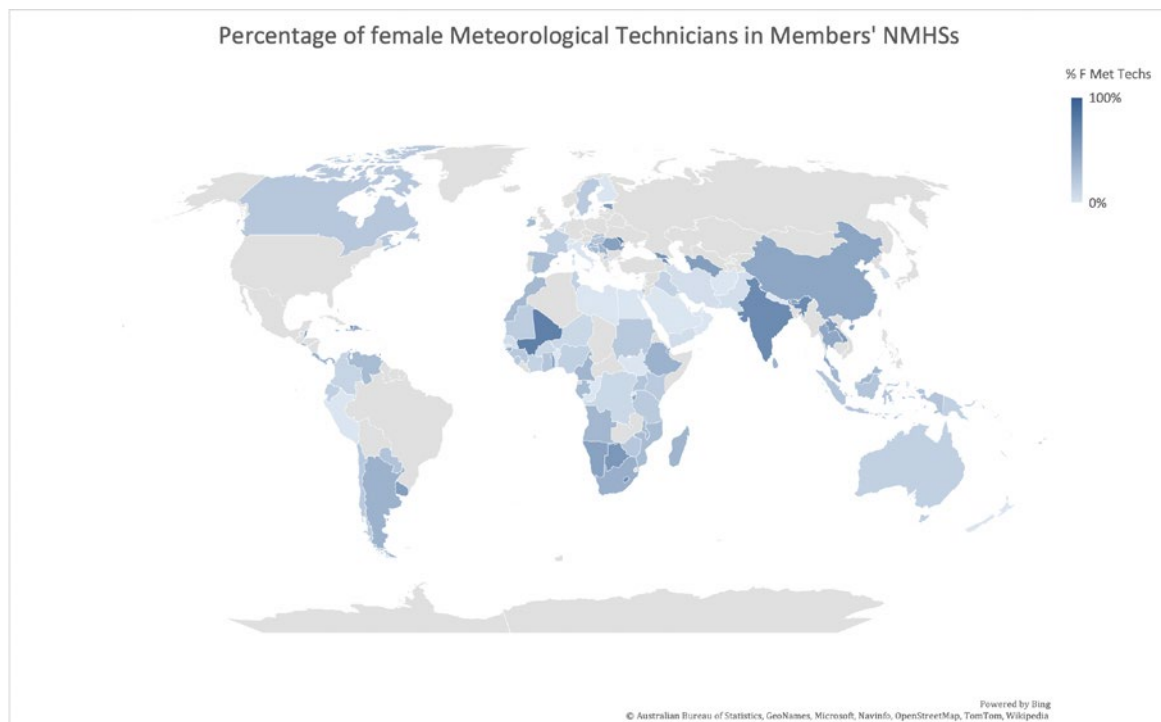
The Members whose NMHSs had the lowest percentages of female Meteorologists are shaded very pale blue. The lowest percentage according to the 2021 survey respondents was 0%.

The Members whose NMHSs had the highest percentages of female Meteorologists are shaded dark blue. The highest percentage according to the 2021 survey respondents was 100%.

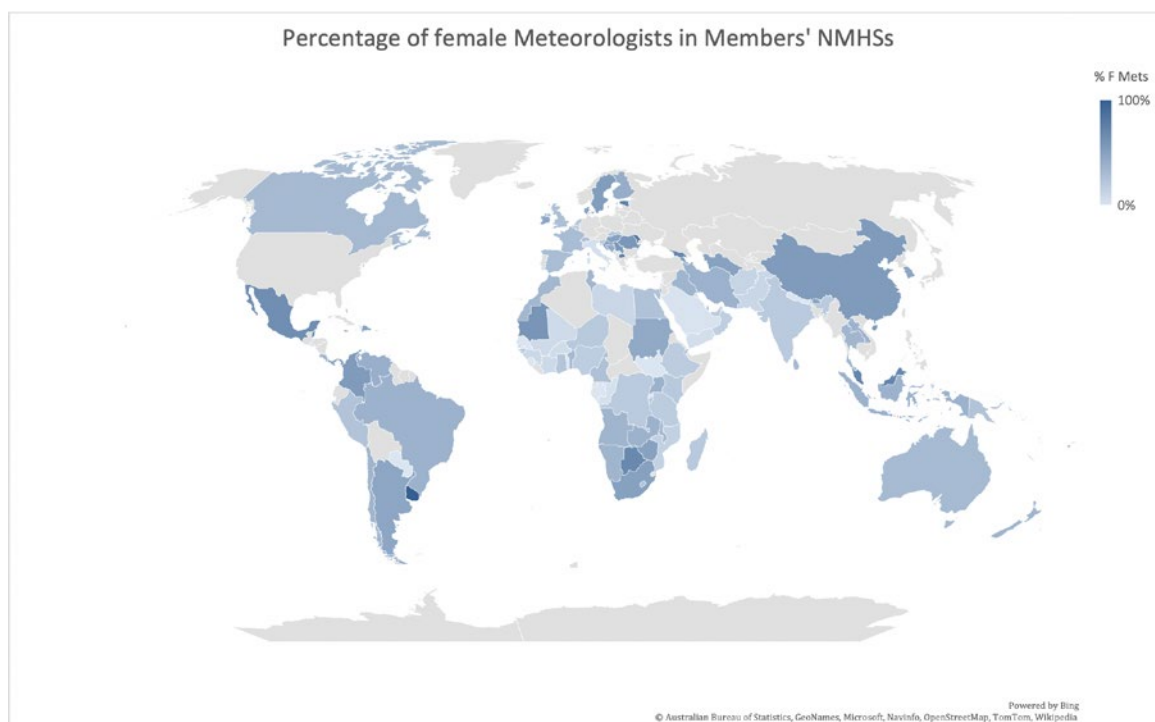
The Members whose NMHSs had a staff of Meteorologists that was between 0% and 100% female are coloured in gradually changing hues of blue.

The Members whose survey respondents did not share information on this topic or that did not respond to the survey are shaded pale grey.

Both maps show that Members within the various regions varied substantially with respect to the percentage of women employed at their NMHSs in these two large professional categories at the time of the survey.



**Map 6. Percentage of female Meteorological Technicians in Members' NMHSs**



**Map 7. Percentage of female Meteorologists in Members' NMHSs**

### 2.1.3 ***Number of staff with a university degree***

#### **Major findings**

- Globally, about two thirds (68%) of all NMHS staff members had a university degree at the time of the 2021 survey according to the survey respondents.
- Regional workforces, when considered as a whole, varied in the percentage of their NMHS staff members that had a university degree, from a little over one third in Regions I and III, to about half in Regions IV and VI, and about three quarters in Regions II and V.
- For 15% of the respondents, almost all of their staff members (75% to 100%) had a university degree. For 35% of the respondents, more than half of their staff members had a university degree.
  - The most common percentage range of staff members with a university degree was 25% to 49%. Forty-three per cent of respondents fit into this category.
  - For almost a quarter of the respondents (22%), only a small percentage of their NMHS staff members (0% to 24%) had a university degree.
  - The percentage of NMHS staff members with a university degree varied among the regions.

#### **Detailed results**

Table 16 shows the number of responses regarding the number of NMHS staff with a university degree.

**Table 16. Number of responses regarding the number of NMHS staff with a university degree**

	Region						Global
	I	II	III	IV	V	VI	
Number of respondents that shared information about the number of their staff members with a university degree	45	25	9	15	14	25	133
Total no. of survey respondents	46	25	9	18	14	27	139

Of the 139 Members that responded to the survey, 133 shared information about the number of their staff members with a university degree. All of the Members in Regions I, II, III, and V that responded to the survey shared information on this topic. Three Members from Region IV that responded to the survey and two Members from Region VI that responded to the survey did not share information on this topic.

Table 17 shows the numbers and percentages of NMHS staff with a university degree, regionally and globally. This table also shows total numbers of NMHS staff, both for all the survey respondents and for those survey respondents that shared information about this topic.

**Table 17. Numbers/percentages of NMHS staff with a university degree and total numbers of staff, globally and regionally**

Number/per cent of staff	Region						Global
	I	II	III	IV	V	VI	
Total number of NMHS staff with a university degree according to the respondents	4 760	55 219	1 288	393	6 059	7 277	74 996
Total number of NMHS staff reported by all the respondents	13 006	69 660	3 596	7 493	8 384	17 153	11 9292
Total number of NMHS staff reported by the respondents that shared information about this topic	13 006	69 660	3 596	826	8 384	14 261	109 733
Per cent of NMHS staff with a university degree of the respondents that shared information about this topic	37%	79%	36%	48%	72%	51%	68%

The first row of Table 17 shows that worldwide, almost 75 000 NMHS staff members had a university degree at the time of the survey according to the respondents. The staff members with university degrees were distributed across the regions, from 393 in Region IV to more than 55 000 in Region II. (Note that the number of staff members with a university degree in Region IV was low because two of the respondents in Region IV that did not share information on this topic have large NMHSs. This point is discussed further below.)

The last row of the table shows the percentages of NMHS staff in the various regions and globally that have university degrees.

The middle two rows of the table show the total number of NMHS staff members. The second row shows the total number of staff members in each region's NMHS workforce. The respondents reported these numbers for the survey question about how many men and women work in their NMHSs.

The third row also shows total number of NMHS staff members, but for only the respondents that shared information about how many of their staff members have a university degree. These totals were used to calculate the percentages of staff with a university degree. The orange cells show why the distinction between the totals in rows two and three is important.

The dark orange cell in the Region IV column shows the total number of NMHS staff reported by the Region IV survey respondents (7 493 people). The light orange cell in the Region IV column shows the total number of staff of the NMHSs of only those respondents that shared information about how many of their staff members have a university degree (826 people). The large difference in the two numbers is due to the fact that two of the three Region IV respondents that did not share information about the number of their staff members with a university degree have large NMHSs.

Because the number of NMHS staff in Region IV with a university degree is so much smaller than the total number of Region IV staff reported by the respondents, the resulting percentage is quite low. For this reason, the percentage of Region IV NMHS staff with a university degree has been calculated based on the total number of NMHS staff of only those respondents that shared information about this topic (the pale orange cell).

The same is true for Region VI. The dark orange cell in the Region VI column shows the total number of NMHS staff reported by the Region VI survey respondents (17 153 people). The light orange cell in the Region VI column shows the total number of staff of the NMHSs of only those respondents that shared information about how many of their staff members have a university degree (14 261 people). The difference in the two numbers is due to the fact that one of the two Region VI respondents that did not share information about the number of their NMHS staff members with a university degree also has a large NMHS. As was the case for Region IV, the percentage of Region VI NMHS staff with a university degree has been calculated based on the total number of NMHS staff of only those respondents that shared information about this topic (the pale orange cell).

The global percentage of NMHS staff members with a university degree has also been calculated based on the total number of staff worldwide of the NMHSs of only those respondents that shared information about the number of their NMHS staff members with a university degree.

Globally, according to the respondents who shared information on this topic, 68% of their NMHS staff members had a university degree at the time of the survey.

In both Region II and Region V, more than 70% of the respondents' NMHS staff members had a university degree (79% and 72%, respectively).

About half of the respondents' NMHS staff members in Regions IV and VI have a university degree (48% and 51%, respectively).

In both Region I and Region III, 36% to 37% of the respondents' NMHS staff members have a university degree.

The survey question about the number of NMHS staff with a university degree asked the Members to specify how many of their male staff and how many of their female staff have a university degree.

While 133 survey respondents submitted information regarding the total number of their NMHS staff with a university degree, a database error made it necessary for WMO to ask Members to provide more detailed information in this regard with respect the breakdown by gender. Ninety-three Members provided this additional information, and these more detailed responses were used to analyse the numbers of male and female staff with a university degree.

Table 18 shows the number of respondents that provided information regarding the number of their NMHS staff with a university degree along with the number of respondents that specified the number of their female and male staff with a university degree.

**Table 18. Number of respondents that provided information regarding the number of their NMHS staff with a university degree and number of respondents that specified the number of their female and male staff with a university degree**

	<i>Region</i>						<i>Global</i>
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>VI</i>	
Number of respondents that provided information about the number of their staff with a university degree	45	25	9	15	14	25	133
Number of respondents that specified the number of their female and male staff with a university degree	23	21	5	12	11	21	93
Total no. of survey respondents	46	25	9	18	14	27	139

Table 18 shows that while many of the respondents from Regions II, IV, V, and VI provided information regarding the breakdown by gender of their staff with a university degree, only about half of the respondents from Regions I and III provided this information. It is important to keep this in mind when considering the survey results concerning the number of male and female staff with a university degree in Regions I and III.

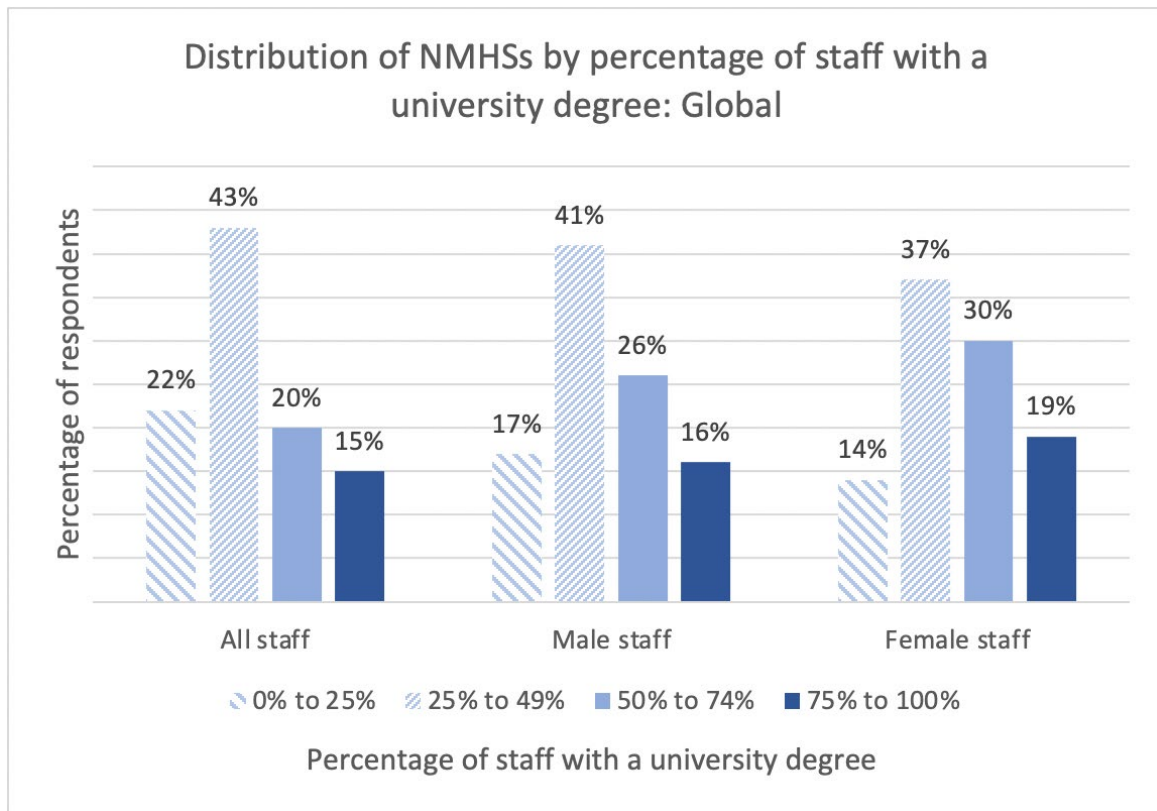
### **Global**

Table 19 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 19. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

<i>% of staff</i>	<i>Number of respondents</i>			<i>% of staff</i>	<i>Percentage of respondents</i>		
	<i>All</i>	<i>Male</i>	<i>Female</i>		<i>All</i>	<i>Male</i>	<i>Female</i>
<25%	29	16	13	<25%	22%	17%	14%
25% to 49%	57	38	34	25% to 49%	43%	41%	37%
50% to 74%	27	24	28	50% to 74%	20%	26%	30%
75% to 100%	20	15	18	75% to 100%	15%	16%	19%
Total	133	93	93	Total	100%	100%	100%

Figure 25 shows the global distribution of NMHSs by the percentage of their staff with a university degree.



**Figure 25. Distribution of NMHSs by percentage of staff with a university degree: Global**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 19 and Figure 25 show that 15% of the respondents indicated that almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Twenty per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 35% of the respondents indicated that more than half of the staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of NMHS staff with a university degree was 25% to 49%; 43% of the respondents indicated that their NMHS staff fit into this category at the time of the survey.



Almost a quarter of the respondents (22%) indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Male staff*

The percentage of male staff in each percentage range was similar to the percentage of all staff in each percentage range.

Sixteen per cent of the respondents indicated that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Twenty-six per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 42% of the respondents indicated that more than half of the male staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of male NMHS staff members with a university degree was 25% to 49%; 41% of the respondents indicated that their male NMHS staff fit into this category at the time of the survey.

Seventeen per cent of the respondents indicated that only a small percentage of their male NMHS staff (0% to 24%) had a university degree at the time of the survey.

#### *Female staff*

Nineteen per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty per cent of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that almost half of the respondents (49%) indicated that more than half of the female staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of female staff members with a university degree was 25% to 49%; 37% of the respondents indicated that their female NMHS staff fit into this category at the time of the survey.

Fourteen per cent of the respondents indicated that only a small percentage of their female NMHS staff (0% to 24% of female staff) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff ("all staff") that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of "all staff" than do the percentages of female staff.
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

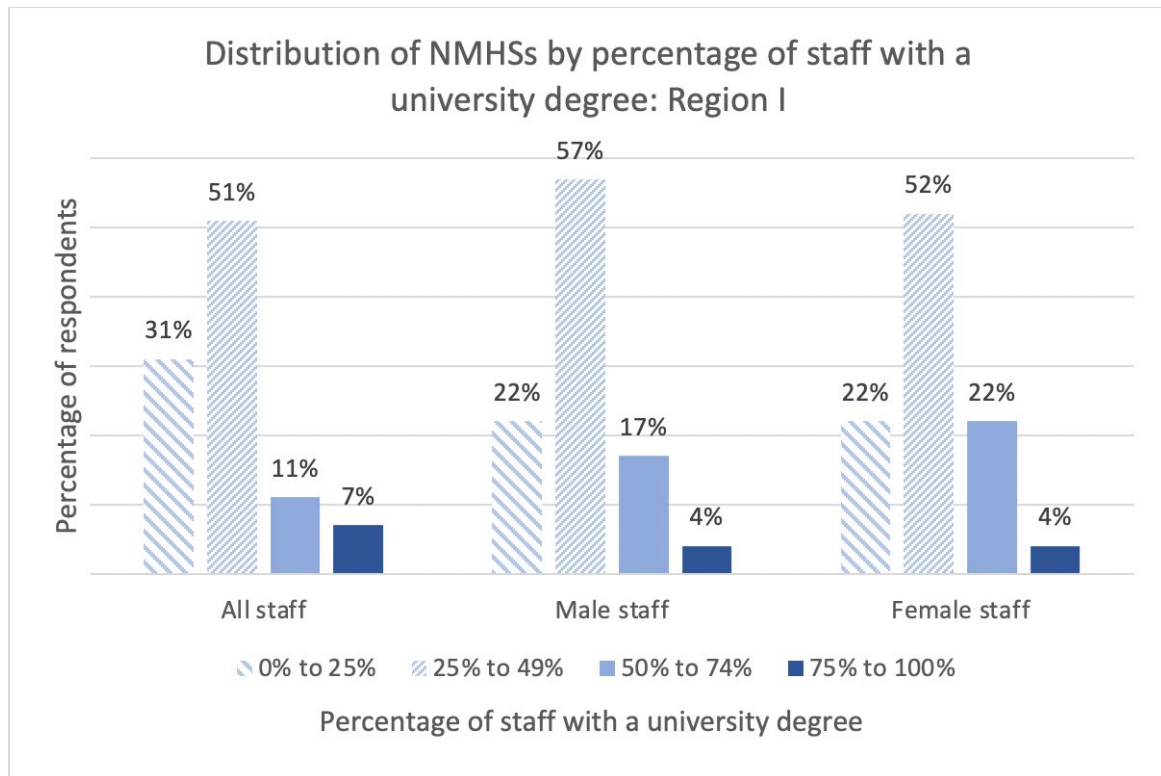
**Region I**

Table 20 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 20. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

% of staff	Number of respondents			% of staff	Percentage of respondents		
	All	Male	Female		All	Male	Female
<25%	14	5	5	<25%	31%	22%	22%
25% to 49%	23	13	12	25% to 49%	51%	57%	52%
50% to 74%	5	4	5	50% to 74%	11%	17%	22%
75% to 100%	3	1	1	75% to 100%	7%	4%	4%
Total	45	23	23	Total	100%	100%	100%

Figure 26 shows the distribution of NMHSs in Region I by the percentage of their staff with a university degree.



**Figure 26. Distribution of NMHSs by percentage of staff with a university degree: Region I**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 20 and Figure 26 show that 7% of the respondents in Region I indicated that almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Eleven per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 18% of the respondents indicated that more than half of the staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of NMHS staff with a university degree was 25% to 49%; just over half of the respondents (51%) indicated that their NMHS staff fit into this category at the time of the survey.

For almost one third of the respondents (31%), only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Male staff*

Four per cent of the respondents indicated that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Seventeen per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 21% of the respondents indicated that more than half of the male staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of male NMHS staff members with a university degree was 25% to 49%; 57% of the respondents indicated that their male NMHS staff fit into this category at the time of the survey.

Twenty-two per cent of the respondents indicated that only a small percentage of their male NMHS staff (0% to 24%) had a university degree at the time of the survey.

#### *Female staff*

Four per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Twenty-two per cent of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 26% of the respondents indicated that more than half of the female staff of their NMHSs had a university degree at the time of the survey.

The most common percentage range of female staff members with a university degree was 25% to 49%; 52% of the respondents indicated that their female NMHS staff fit into this category at the time of the survey.

Twenty-two per cent of the respondents indicated that only a small percentage of their female NMHS staff (0% to 24% of female staff) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff ("all staff") that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of "all staff" than do the percentages of female staff.
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

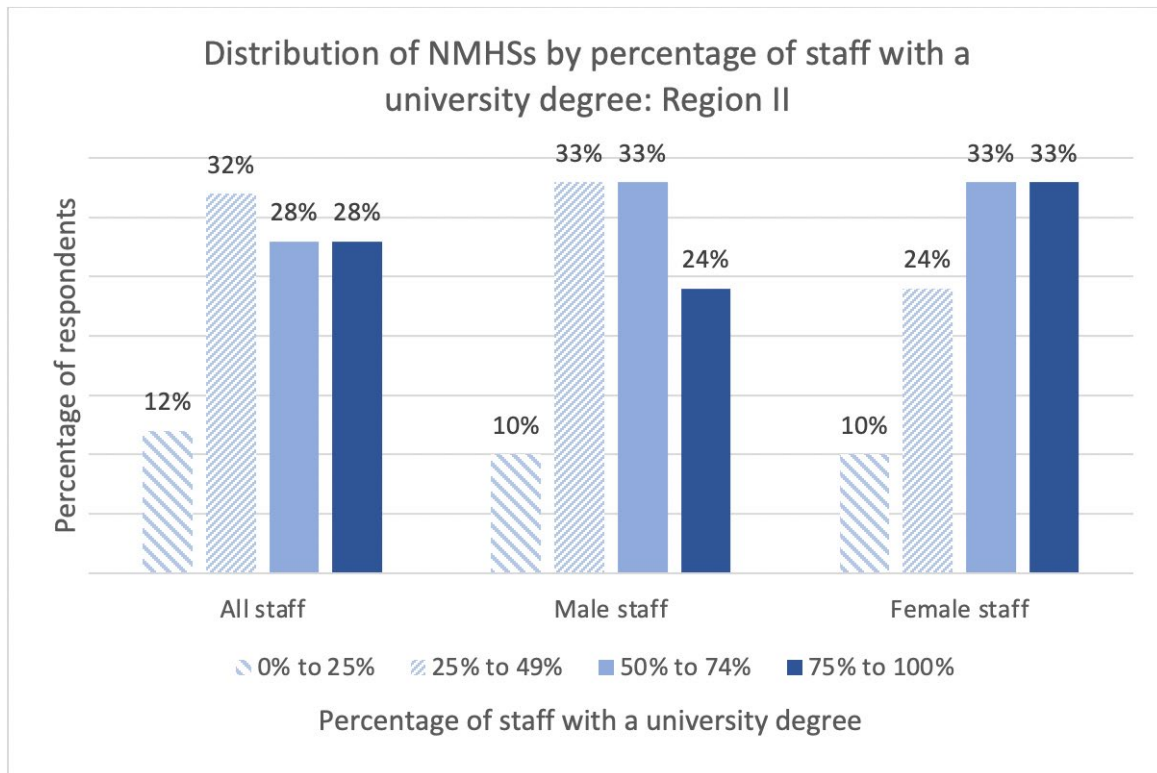
## Region II

Table 21 shows the numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 21. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

% of staff	Number of respondents			% of staff	Percentage of respondents		
	All	Male	Female		All	Male	Female
<25%	3	2	2	<25%	12%	10%	10%
25% to 49%	8	7	5	25% to 49%	32%	33%	24%
50% to 74%	7	7	7	50% to 74%	28%	33%	33%
75% to 100%	7	5	7	75% to 100%	28%	24%	33%
Total	25	21	21	Total	100%	100%	100%

Figure 27 shows the distribution of NMHSs in Region II by the percentage of their staff with a university degree.



**Figure 27. Distribution of NMHSs by percentage of staff with a university degree: Region II**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 21 and Figure 27 show that 28% of the respondents in Region II indicated that almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Twenty-eight per cent of the respondents indicate that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that for more than half of the respondents (56%), more than half of the staff of their NMHSs had a university degree at the time of the survey.

For 32% of the respondents, 25% to 49% of the staff of their NMHSs had a university degree at the time of the survey.

Twelve per cent of the respondents indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

*Male staff*

The percentage of male staff in each percentage range was similar to the percentage of all staff in each percentage range.

Twenty-four per cent of the respondents indicated that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-three per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that for more than half of the respondents (57%), more than half of the male staff of their NMHSs had a university degree.

Thirty-three per cent of the respondents indicated that 25% to 49% of the male staff of their NMHSs had a university degree.

Ten per cent of the respondents indicated that only a small percentage of their male NMHS staff (0% to 24%) had a university degree.

*Female staff*

Thirty-three per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Another 33% of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that for two thirds of the respondents (66%), more than half of the female staff of their NMHSs had a university degree at the time of the survey.

Twenty-four per cent of the respondents indicated that 25% to 49% of their female NMHS staff members had a university degree at the time of the survey.

Ten per cent of the respondents indicated that only a small percentage of their female NMHS staff (0% to 24%) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff ("all staff") that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of "all staff" than do the percentages of female staff.
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

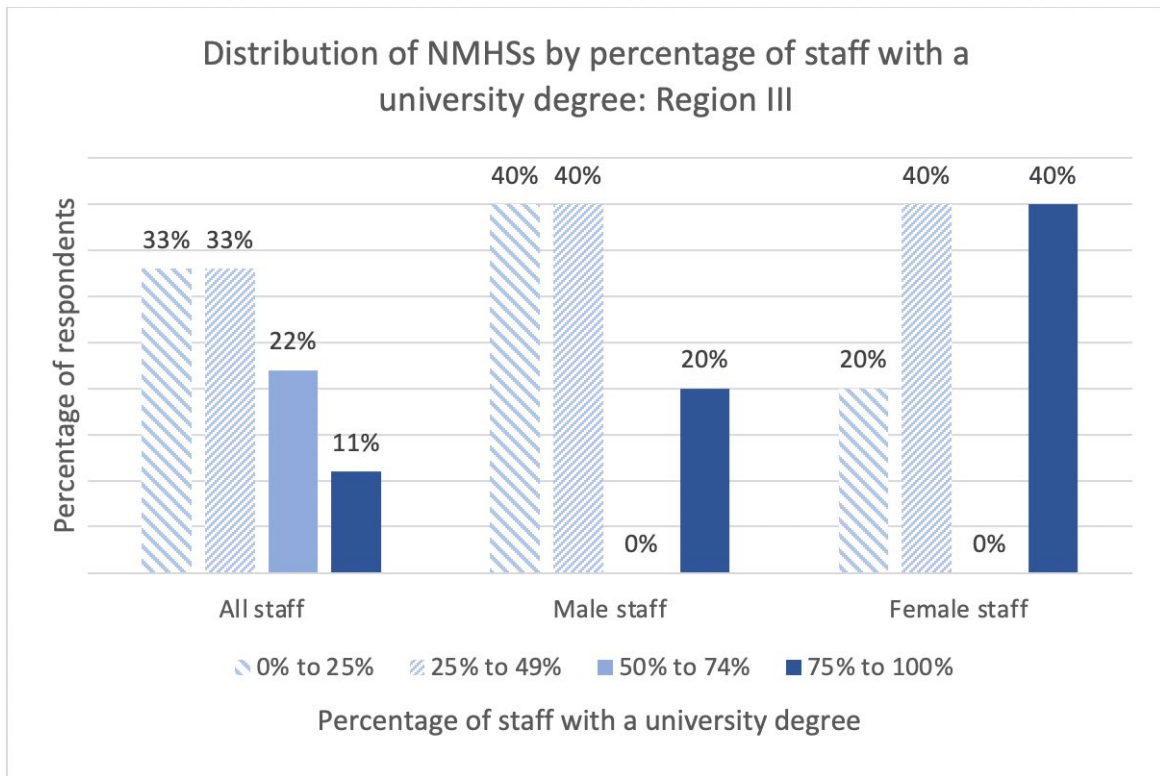
**Region III**

Table 22 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 22. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

% of staff	Numbers of respondents			% of staff	Percentages of respondents		
	All	Male	Female		All	Male	Female
<25%	3	2	1	<25%	33%	40%	20%
25% to 49%	3	2	2	25% to 49%	33%	40%	40%
50% to 74%	2	0	0	50% to 74%	22%	0%	0%
75% to 100%	1	1	2	75% to 100%	11%	20%	40%
Total	9	5	5	Total	100%	100%	100%

Figure 28 shows the distribution of NMHSs in Region III by the percentage of their staff with a university degree.



**Figure 28. Distribution of NMHSs by percentage of staff with a university degree: Region III**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHSs had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 22 and Figure 28 show that 11% of the respondents in Region III indicated that almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Twenty-two per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that one third of the respondents (33%) indicated that more than half of the staff of their NMHSs had a university degree at the time of the survey.

Another 33% of the respondents indicated that 25% to 49% of the staff of their NMHSs had a university degree at the time of the survey.

The remaining 33% of the respondents indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

(Region III's percentages for all staff divide evenly into thirds because a total of nine respondents from Region III shared information on this topic.)

#### *Male staff*

Twenty per cent of the respondents indicated that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

No Region III respondents reported that 50% to 74% of the male staff of their NMHSs had a university degree at the time of the survey at the time of the survey.

Forty per cent of the respondents indicated that 25% to 49% of the male staff of their NM/HSs had a university degree at the time of the survey.

The remaining 40% of the respondents indicated that only a small percentage of the male staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Female staff*

Forty per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

No Region III respondents reported that 50% to 74% of the female staff of their NMHSs had a university degree at the time of the survey.

Forty per cent of the respondents indicated that 25% to 49% of the female staff of their NMHSs had a university degree at the time of the survey.

Twenty per cent of the respondents indicated that only a small percentage of the female staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff ("all staff") that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of "all staff" than do the percentages of female staff.



- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

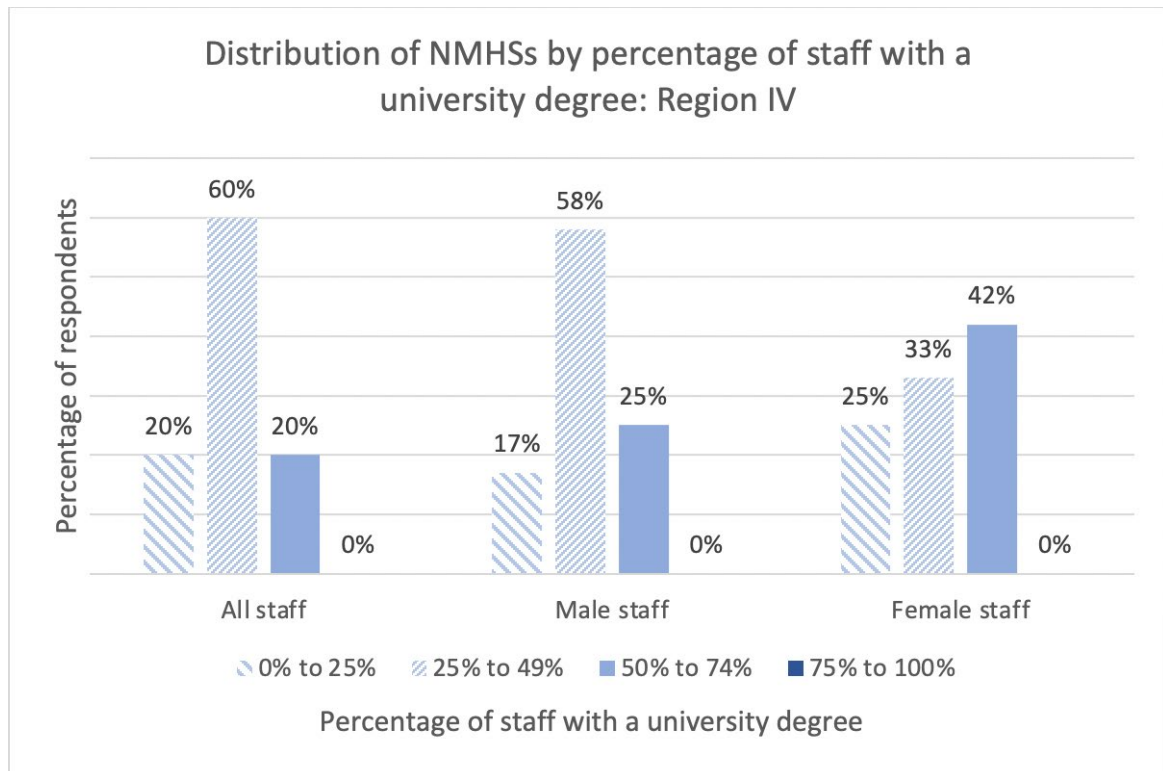
**Region IV**

Table 23 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 23. Numbers and percentages of respondents with various percentages of staff with university degrees**

% of staff	Numbers of respondents			% of staff	Percentages of respondents		
	All	Male	Female		All	Male	Female
<25%	3	2	3	<25%	20%	17%	25%
25% to 49%	9	7	4	25% to 49%	60%	58%	33%
50% to 74%	3	3	5	50% to 74%	20%	25%	42%
75% to 100%	0	0	0	75% to 100%	0%	0%	0%
Total	15	12	12	Total	100%	100%	100%

Figure 29 shows the distribution of NMHSs in Region IV by the percentage of their staff with a university degree.



**Figure 29. Distribution of NMHSs by percentage of staff with a university degree: Region IV**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 23 and Figure 29 show that no Region IV respondents indicated that almost all of the staff of their NMHS (75% to 100%) had a university degree at the time of the survey.

Twenty per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

The most common percentage range of NMHS staff with a university degree was 25% to 49%; 60% of the respondents fit into this category at the time of the survey.

Twenty per cent of the respondents indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Male staff*

The percentage of male staff in each percentage range was similar to the percentage of all staff in each percentage range.

No Region IV respondents reported that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-five per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

The most common percentage range of male NMHS staff members with a university degree was 25% to 49%; 58% of the respondents indicated that their male NMHS staffs fit into this category at the time of the survey.

Seventeen per cent of the respondents indicated that only a small percentage of their male NMHS staff (0% to 24%) had a university degree at the time of the survey.

#### *Female staff*

No Region IV respondents reported that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Forty-two per cent of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

Thirty-three per cent of the respondents indicated that 25% to 49% of the female staff of their NMHSs had a university degree.

Twenty-five per cent of the respondents indicated that only a small percentage of their female NMHS staff members (0% to 24%) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff (“all staff”) that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of “all staff” than do the percentages of female staff.
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

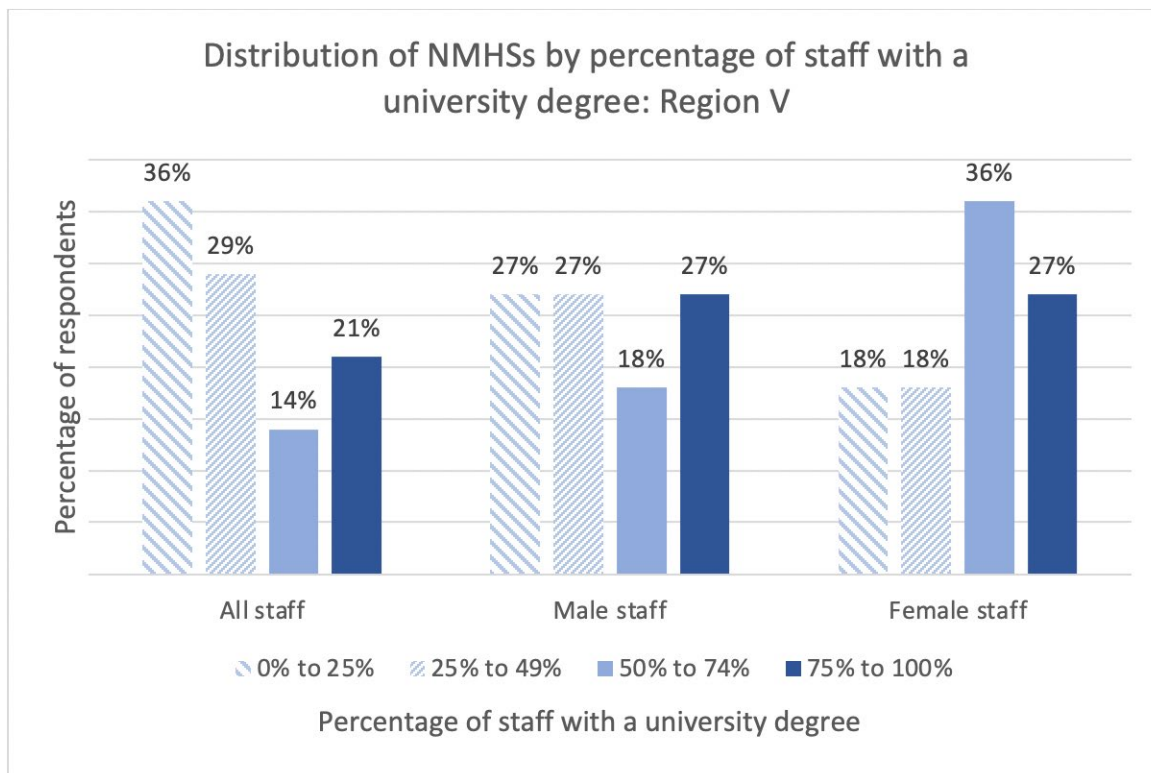
**Region V**

Table 24 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 24. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

% of staff	Number of respondents			% of staff	Percentages of respondents		
	All	Male	Female		All	Male	Female
<25%	5	3	2	<25%	36%	27%	18%
25% to 49%	4	3	2	25% to 49%	29%	27%	18%
50% to 74%	2	2	4	50% to 74%	14%	18%	36%
75% to 100%	3	3	3	75% to 100%	21%	27%	27%
Total	14	11	11	Total	100%	100%	100%

Figure 30 shows the distribution of NMHSs in Region V by the percentage of their staff with a university degree.



**Figure 30. Distribution of NMHSs by percentage of staff with a university degree: Region V**

The dark blue segment represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 24 and Figure 30 show that for 21% of the respondents in Region V, almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Fourteen per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 35% of the respondents indicated that more than half of the staff of their NMHSs had a university degree at the time of the survey.

Twenty-nine per cent of the respondents indicated that 25% to 49% of the staff of their NMHSs had a university degree at the time of the survey.

Thirty-six per cent of the respondents indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

*Male staff*

Twenty-seven per cent of the respondents indicated that almost all the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Eighteen per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that 45% of the respondents indicated that more than half of the male staff of their NMHSs had a university degree at the time of the survey.

Twenty-seven per cent of the respondents indicated that 25% to 49% of the male staff of their NMHSs had a university degree at the time of the survey.

Twenty-seven per cent of the respondents indicated that only a small percentage of the male staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

*Female staff*

Twenty-seven per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-six per cent of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that almost two thirds of the respondents (63%) indicated that more than half of the female staff of their NMHSs had a university degree at the time of the survey.

Eighteen per cent of the respondents indicated that 25% to 49% of the female staff of their NMHSs had a university degree at the time of the survey.

Eighteen per cent of the respondents indicated that only a small percentage of the female staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff ("all staff") that had a university degree at the time of the survey, the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of "all staff" than do the percentages of female staff.
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

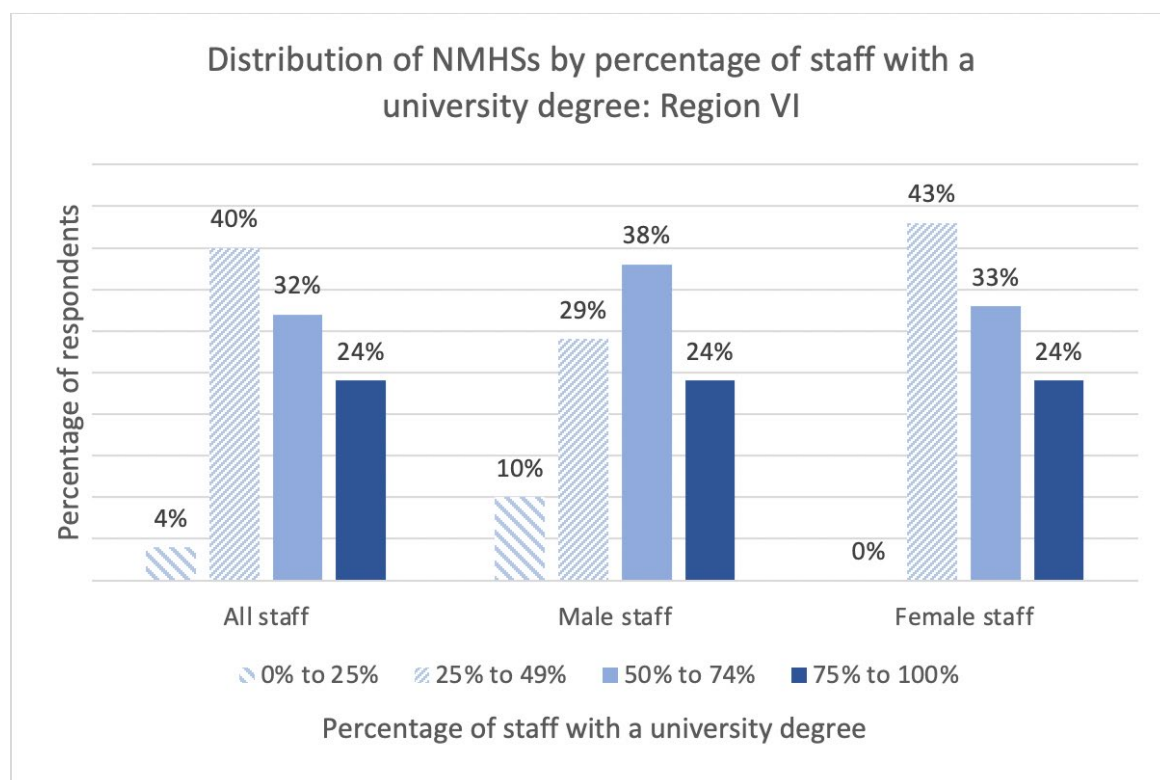
**Region VI**

Table 25 shows the numbers and percentages of the respondents whose NMHSs had the given percentages of staff with a university degree.

**Table 25. Numbers and percentages of respondents whose NMHSs had the given percentages of staff with a university degree**

% of staff	Numbers of respondents			% of staff	Percentages of respondents		
	All	Male	Female		All	Male	Female
<25%	1	2	0	<25%	4%	10%	0%
25% to 49%	10	6	9	25% to 49%	40%	29%	43%
50% to 74%	8	8	7	50% to 74%	32%	38%	33%
75% to 100%	6	5	5	75% to 100%	24%	24%	24%
Total	25	21	21	Total	100%	100%	100%

Figure 31 shows the distribution of NMHSs in Region VI by the percentage of their staff with a university degree.

**Figure 31. Distribution of NMHSs by percentage of staff with a university degree: Region VI**

The dark blue bar represents the percentage of respondents that indicated that their NMHS had the highest percentage of staff members (75% to 100%) with a university degree at the time of the survey.

The pale blue bar represents the percentage of respondents that indicated that their NMHS had the next highest percentage of staff members (50% to 74%) with a university degree at the time of the survey.

The bar with narrow stripes represents the percentage of respondents that indicated that their NMHS had the third highest percentage of staff members (25% to 49%) with a university degree at the time of the survey.

The bar with wide stripes represents the percentage of respondents that indicated that their NMHS had the lowest percentage of staff members (0% to 24%) with a university degree at the time of the survey.

#### *All staff*

Table 25 and Figure 31 show that for 24% of the respondents in Region VI, almost all of the staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-two per cent of the respondents indicated that most of the staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that more than half of the respondents (56%) indicated that more than half of the staff of their NMHSs had a university degree at the time of the survey.

Forty per cent of the respondents indicated that 25% to 49% of the staff of their NMHSs had a university degree at the time of the survey.

Four per cent of the respondents indicated that only a small percentage of the staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Male staff*

Twenty-four per cent of the respondents indicated that almost all of the male staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-eight per cent of the respondents indicated that a majority of the male staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that more than half of the respondents (62%) indicated that more than half of their male NMHS staff members had a university degree at the time of the survey.

Twenty-nine per cent of the respondents indicated that 25% to 49% of the male staff members of their NMHSs had a university degree at the time of the survey.

Ten per cent of the respondents indicated that only a small percentage of the male staff of their NMHSs (0% to 24%) had a university degree at the time of the survey.

#### *Female staff*

Twenty-four per cent of the respondents indicated that almost all of the female staff of their NMHSs (75% to 100%) had a university degree at the time of the survey.

Thirty-three per cent of the respondents indicated that a majority of the female staff of their NMHSs (50% to 74%) had a university degree at the time of the survey.

These two categories viewed together show that more than half of the respondents (57%) indicated that more than half of their female NMHS staff members had a university degree at the time of the survey.

Forty-three per cent of the respondents indicated that 25% to 49% of their female NMHS staff had a university degree at the time of the survey.

No Region VI respondents reported that 0% to 24% of the female staff of their NMHSs had a university degree at the time of the survey.

Note: When regarding the percentages of respondents that provided information about the percentages of their male NMHS staff, their female NMHS staff and the combination of their male and female NMHS staff (“all staff”) that had a university degree at the time of the survey the following points should be kept in mind:

- Female staff form 35% of the global workforce, and male staff form 65% of the global workforce, so the percentages of male staff form a larger component of the percentages of “all staff” than do the percentages of female staff
- Some respondents shared information about the total number of their NMHS staff that had a university degree but did not indicate the specific numbers of men and women in their NMHSs that had a university degree. As a result, the percentages for all staff were calculated for a different set of respondents than the percentages for male and female staff.

#### 2.1.4 **Number of staff by age category**

##### **Major findings**

- The global distribution of NMHS staff members among the age brackets was identical for the 2017 and the 2021 survey respondents: 17% were <30 years old, 26% were 31–40 years old, 27% were 41–50 years old, and 31% were more than 50 years old.
- Globally, and in five of the six regions, more than half of all NMHS staff members were more than 40 years old at the time of the 2021 survey.
- Members varied widely in their percentages of NMHS staff members who were more than 40 years old at the time of the 2021 survey, from 0% to 91%.

##### **Detailed results**

One hundred thirty-seven respondents to the 2021 survey submitted information regarding the number of their NMHS staff members in specific age categories. A database error subsequently made it necessary for WMO to ask Members to confirm this information. Table 26 shows the distribution of the original and confirmed responses by region.

**Table 26. Number of responses regarding the number of NMHS staff by age category**

	<i>Region</i>						<i>Global</i>
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>VI</i>	
Number of respondents that shared information about the number of their NMHS staff members in specific age categories	44	25	9	18	14	27	137
Number of respondents that confirmed this information	25	21	5	13	11	23	98
Total no. of survey respondents	46	25	9	18	14	27	139

The 98 responses that confirmed the age-category information were used to analyse the age distribution of NMHS staff members.

It is important to note that while many of the respondents from Regions II, IV, V, and VI confirmed the age distribution of their NMHS staff members, only about half of the respondents from Regions I and III did so.

Table 27 shows the number of NMHS staff in each region and globally by each age category.



**Table 27. Number of NMHS staff by age category, regionally and globally**

Age category	Region						Global
	I	II	III	IV	V	VI	
< 20 years	25	218	1	30	16	54	344
21–30 years	920	2 540	584	463	2 170	1 614	8 291
31–40 years	2 363	3 935	670	611	2 453	2 979	13 011
41–50 years	2 053	4 123	804	595	2 174	3 827	13 576
> 50 years	2 141	4 290	737	629	1 462	6 234	15 493
Total number of staff for whom age-category information was confirmed	7 502	15 106	2 796	2 328	8 275	14 708	50 715
Total number of staff	13 006	69 660	3 596	7 493	8 384	17 153	119 292

Table 27 shows that globally, the number of staff members for whom age-category information was provided (50 715 people) was less than half of the total number of staff members who were employed at the respondents' NMHSs at the time of the survey (119 292 people). The regions varied with respect to the number of NMHS staff members the respondents provided age-category information for compared to the total number of staff members they reported that their NMHSs employed at the time of the survey. For example, the Region II respondents provided age-category information for approximately 15 000 people but reported that their NMHSs employed approximately 70 000 total staff.

While the number of staff members for whom age-category information was provided was not representative of the total staff of the respondents' NMHSs, age information can still be accurately described for the 98 Members that did confirm this information. Table 28 shows the breakdown in terms of the percentages of NMHS staff in each age category for those Members that provided this information.

**Table 28. Percentage of NMHS staff in the given age categories at the time of the 2021 survey, regionally and globally**

Age category	Region						Global
	I	II	III	IV	V	VI	
< 20 years	0.3%	1%	0.0%	1%	0.2%	0.4%	1%
21–30 years	12%	17%	21%	20%	26%	11%	16%
31–40 years	31%	26%	24%	26%	30%	20%	26%
41–50 years	27%	27%	29%	26%	26%	26%	27%
> 50 years	29%	28%	26%	27%	18%	42%	31%
Total	100%	100%	100%	100%	100%	100%	100%
> 40 years	56%	56%	55%	53%	44%	68%	57%

The "Global" column in Table 28 shows that for the 98 Members that reported age-category information concerning their NMHS staffs, 1% of their staff members were younger than 20 years old, 16% were 21–30 years old, 26% were 31–40 years old, 27% were 41–50 years old, and 31% were more than 50 years old. In other words, almost one third of NMHS staff members were more than 50 years old, about one quarter of NMHS staff members were 41–50 years old, about one quarter were 31–40 years old, and about 17% were 30 years old and younger at the time of the survey, according to the respondents. (The slight discrepancies between the sums of the percentages in each column and the totals of 100% in the "Total" row are due to rounding.)

The ">40 years" row in Table 28 contains the sum of the percentages of the two eldest age categories (41–50 years and >50 years). (The slight discrepancies in the combined percentages compared to the separate age categories result from rounding the percentages.)

In the global NMHS workforce, 57% of NMHS staff members were more than 40 years old.

Regions I, II, III, and IV had similar percentages of staff members that were more than 40 years old at the time of the survey (between 53% and 56% – just over half of their NMHS staff). Region V had the lowest percentage of staff members over 40 years old (44%) and Region VI had the highest (68%).

Globally and for five of the six regions, more than half of all NMHS staff members were more than 40 years old at the time of the survey according to the respondents.

Table 29 shows the age-category information obtained in the 2017 survey. The last row of the table shows the numbers of NMHS staff members for whom age-category information was provided in the 2017 survey.

**Table 29. Percentage of NMHS staff in the given age categories at the time of the 2017 survey, regionally and globally**

Age category	Region						Global
	I	II	III	IV	V	VI	
< 20 years	1%	2%	0.4%	0.1%	5%	0.2%	1%
21–30 years	14%	19%	16%	21%	20%	10%	16%
31–40 years	30%	28%	25%	26%	24%	22%	26%
41–50 years	26%	27%	23%	24%	26%	28%	26%
> 50 years	29%	23%	36%	28%	25%	40%	31%
Total	100%	100%	100%	100%	100%	100%	100%
> 40 years	55%	50%	59%	52%	51%	68%	57%
Number of staff for whom age-category information was provided	11 689	76 234	4 218	7 202	9 184	61 882	170 409

The “Global” columns of Tables 28 and 29 show that globally, the age distribution of NMHS staff was identical in 2017 and 2021 (aside from slight differences due to rounding) according to the respondents to both surveys. This indicates that there is a strong likelihood that the 2021 survey results regarding age categories are accurate.

The “>40 years” row in Table 28 shows that, according to the respondents, more than 50% of all NMHS staff members, globally and in each region, were more than 40 years old at the time of the 2017 survey.

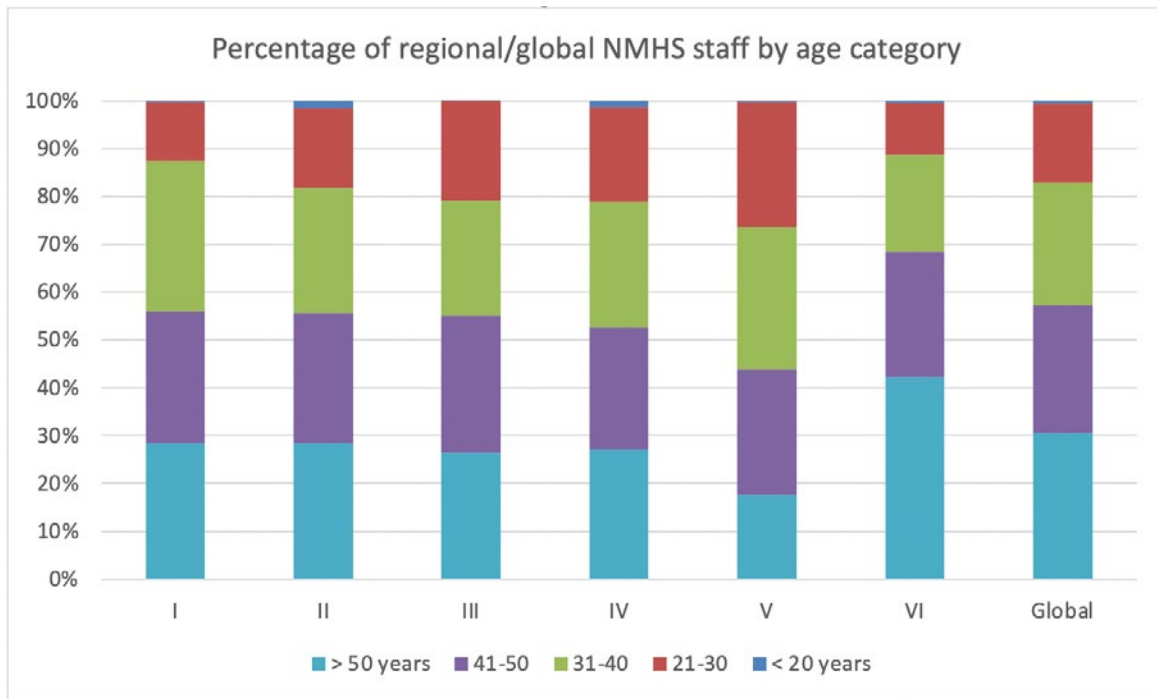
The respondents to the 2017 and 2021 surveys indicated that nearly identical percentages of staff members in Regions I, IV, and VI were more than 40 years old at the time of the surveys.

The Region II respondents to the 2021 survey reported a higher percentage of staff members that were more than 40 years old than the Region II respondents to the 2017 survey.

The Region III and Region V respondents to the 2021 survey reported lower percentages of staff members that were more than 40 years old than the Region III and V respondents to the 2017 survey.

Since the respondents to the two surveys were not identical, it is not possible to determine whether the differences in age-category distribution are a consequence of age-related changes in the intervening four years or simply reflect consistent staffing patterns among the different respondents.

Figure 32 shows the distribution of NMHS staff across the age categories at the time of the 2021 survey according to the respondents.



**Figure 32. Percentage of NMHS staff in the given each age categories, regionally and globally, at the time of the 2021 survey according to the respondents**

The medium blue segments represent the percentage of staff members that were more than 50 years old at the time of the survey according to the respondents.

The purple segments represent the percentage of staff members that were 41–50 years old.

The green segments represent percentage of staff members that were 31–40 years old.

The red segments represent the percentage of staff members that were 21–30 years old.

The dark blue segments represent the percentage of staff members that were less than 20 years old.

For each bar, the medium blue segment and the purple segment, considered together, illustrate that for all regions except Region V, more than half of the NMHS workforce was more than 40 years old at the time of the 2021 survey according to the respondents.

The purple segments illustrate that for most regions, and globally, about one quarter of NMHS staff members were 41–50 years old. The green segments illustrate that about one quarter of NMHS staff members were 31–40 years old.

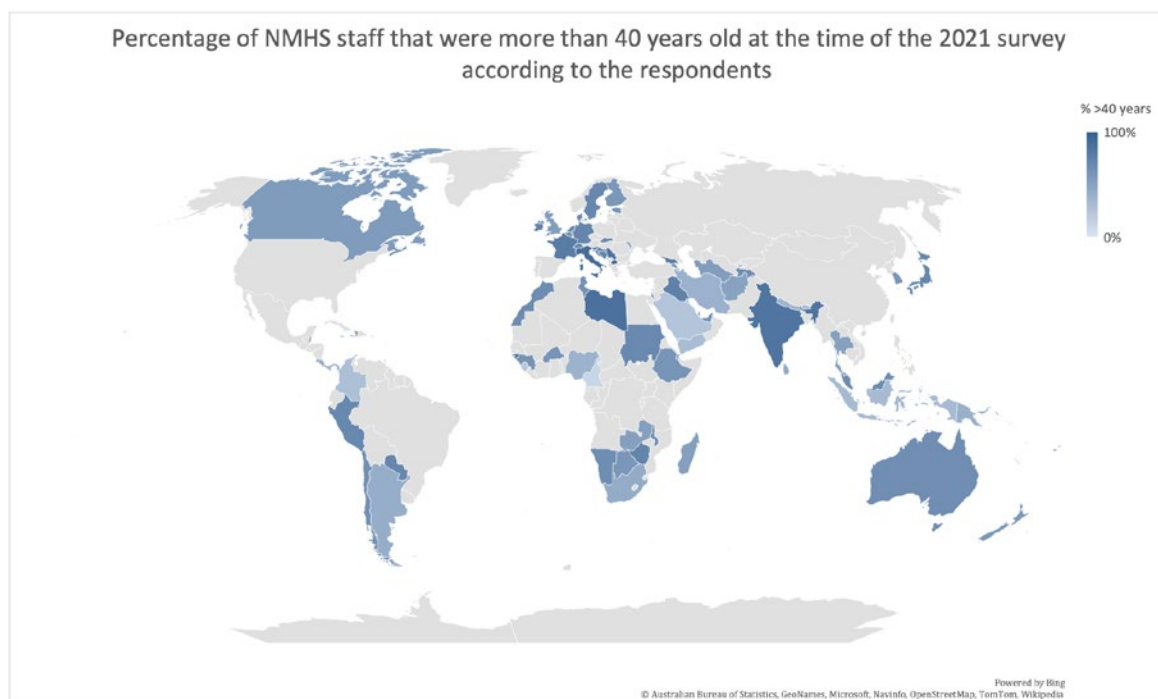
The small size of the dark blue segments illustrates that only 1% or less of NMHS staff members were in the youngest age category. There was at least one staff member in this age category in each region at the time of the survey according to the respondents (see Table 27), but for several regions, the percentage of total staff represented by this category was too small to be visible in Figure 32.

#### **Map of the percentages of NMHS staff that were more than 40 years old at the time of the 2021 survey according to the respondents**

Map 8 shows the percentages of NMHS staff of the 98 Members that confirmed age-category information that were more than 40 years old at the time of the survey. The map is coloured on a gradient from pale blue to dark blue.

- The Members whose NMHSs had the lowest percentages of staff that were more than 40 years old at the time of the survey are shaded very pale blue. The lowest percentage according to the 2021 survey respondents was 0%.
- Only one survey respondent had no staff members that were more than 40 years old at the time of the survey – this is the respondent represented by “0%” on the map’s scale. The Member with the next lowest percentage of staff members that were more than 40 years old at the time of the survey had 12% of staff in this age group.
- The Members whose NMHSs had the highest percentages of staff that were more than 40 years old at the time of the survey were shaded dark blue. The highest percentage according to the 2021 survey respondents was 91%.
- The Members whose NMHSs had between 0% and 91% of staff older than 40 years old at the time of the survey are coloured in gradually changing hues of blue.
- The Members whose survey respondents did not confirm their information about the ages of their staff or that did not respond to the survey are shaded pale grey.

The map shows that Members varied widely in the percentages of their NMHS staff that were more than 40 years old at the time of the survey.



**Map 8. Percentage of NMHS staff that were more than 40 years old at the time of the 2021 survey according to the respondents**

#### 2.1.5 **Staffing trends in the three to five years prior to the 2021 survey**

##### **Major findings**

- Globally, roughly equal numbers of the respondents’ NMHSs experienced the three different staffing trends in the three to five years prior to the 2021 survey: 30% experienced a steadily increasing staffing trend; 40% experienced no significant year-to-year change in their staffing; and 30% experienced a steadily decreasing staffing trend.

- In other words, 70% of the survey respondents indicated that their NMHS staff numbers either increased or remained stable during the three to five years prior to the 2021 survey.
- In all regions, the NMHS staff numbers of at least half of the respondents either increased or remained stable in the three to five years prior to the 2021 survey.
- Region V, in particular, experienced growth in this regard: 64% of Region V respondents saw increasing NMHS staff numbers in the three to five years prior to the 2021 survey, and all Region V NMHS staffs either grew or remained stable during that time.
- Regions III and VI reported the highest percentages of Member NMHSs that experienced decreasing staff numbers in the three to five years prior to the 2021 survey, with over 40% in each region.

### Response rate and overall results

Table 30 shows the number of responses regarding staffing trends.

**Table 30. Number of responses regarding staffing trends**

	Region						Global
	I	II	III	IV	V	VI	
Number of respondents that shared information about staffing trends	46	25	9	18	14	26	138
Total number of survey respondents	46	25	9	18	14	27	139

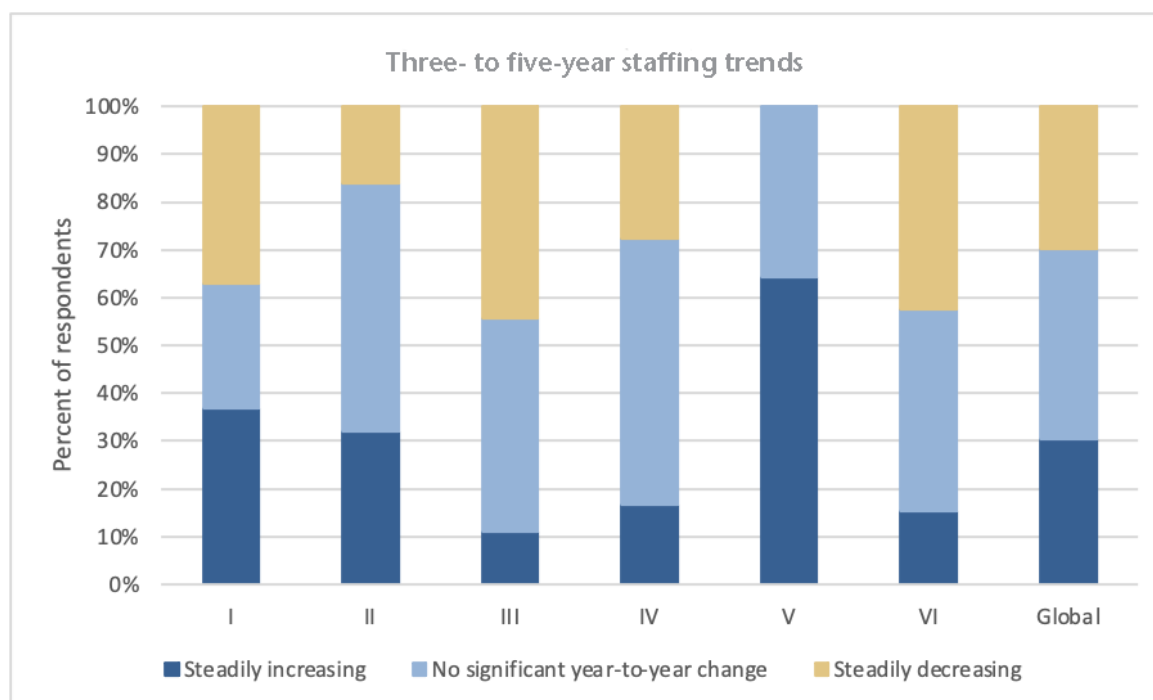
All but one of the survey respondents shared information regarding their staffing trend in the three to five years prior to the 2021 survey.

Table 31 shows the numbers and percentages of respondents that indicated that their NMHS experienced the given staffing trends, globally and regionally.

**Table 31. Number and percentage of respondents that indicated that their NMHS experienced the given staffing trends, globally and regionally**

Staffing trend	Region						Global
	I	II	III	IV	V	VI	
Steadily decreasing							
Number	17	4	4	5	0	11	41
Percentage	37%	16%	44%	28%	0%	42%	30%
No significant year-to-year change							
Number	12	13	4	10	5	11	55
Percentage	26%	52%	44%	56%	36%	42%	40%
Steadily increasing							
Number	17	8	1	3	9	4	42
Percentage	37%	32%	11%	17%	64%	15%	30%
No. of respondents that shared information about staffing trends	46	25	9	18	14	26	138
Percentage of total survey respondents	100%	100%	100%	100%	100%	96%	99%

Figure 33 shows the percentage of respondents that indicated that their NMHS experienced the given staffing trends in the three to five years prior to the 2021 survey, regionally and globally.



**Figure 33. Percentage of respondents that indicated that their NMHS experienced the given staffing trends in the three to five years prior to the 2021 survey**

The dark blue segments represent the percentage of respondents whose NMHS staffs experienced a steadily increasing staffing trend in the three to five years prior to the 2021 survey.

The pale blue segments represent the percentage of respondents whose NMHS staffs had no significant year-to-year change in their staffing in the three to five years prior to the 2021 survey.

The yellow segments show the percentage of respondents whose NMHS staffs experienced a steadily decreasing staffing trend in the three to five years prior to the 2021 survey.

Table 31 and Figure 33 show that globally, roughly equal numbers of respondents reported that their NMHS experienced the three different staffing trends in the three to five years prior to the 2021 survey, with a slightly higher percentage of NMHSs experiencing stable, as opposed to increasing or decreasing, staff numbers. Specifically, thirty per cent of respondents indicated that their NMHS experienced a steadily increasing staffing trend; 40% of the respondents indicated that their NMHS experienced no significant year-to-year change in their staffing; and 30% indicated that their NMHS experienced a steadily decreasing staffing trend.

Many Members' NMHS staffs grew or stayed stable in the three to five years prior to the 2021 survey. Globally, 70% of survey respondents reported that their NMHS staff numbers were stable or increased during that time, while 30% of survey respondents reported that their NMHS staff numbers decreased.

In all regions, at least half of the Members that responded to the survey reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey.

In Region I, 63% of survey respondents reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey, while 37% reported that their NMHS staff numbers decreased during that time.

In Region II, 84% of survey respondents reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey, while 16% reported that their NMHS staff numbers decreased during that time.

In Region III, 56% of survey respondents reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey. Of all the regions, Region III had the highest percentage of Member NMHSs that experienced a decreasing staffing trend during that time (44%).

In Region IV, 72% of survey respondents reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey; 28% reported that their NMHS staff numbers decreased during that time.

Region V, in particular, experienced growth in this regard: 64% of Region V survey respondents reported that their NMHS staff numbers increased in the three to five years prior to the survey, and all Region V NMHS staffs either grew or remained stable during that time.

In Region VI, 58% of survey respondents reported that their NMHS staff numbers were stable or increased in the three to five years prior to the survey. Region VI also had one of the higher percentages of Member NMHSs that experienced a decreasing staffing trend during that time (42%).

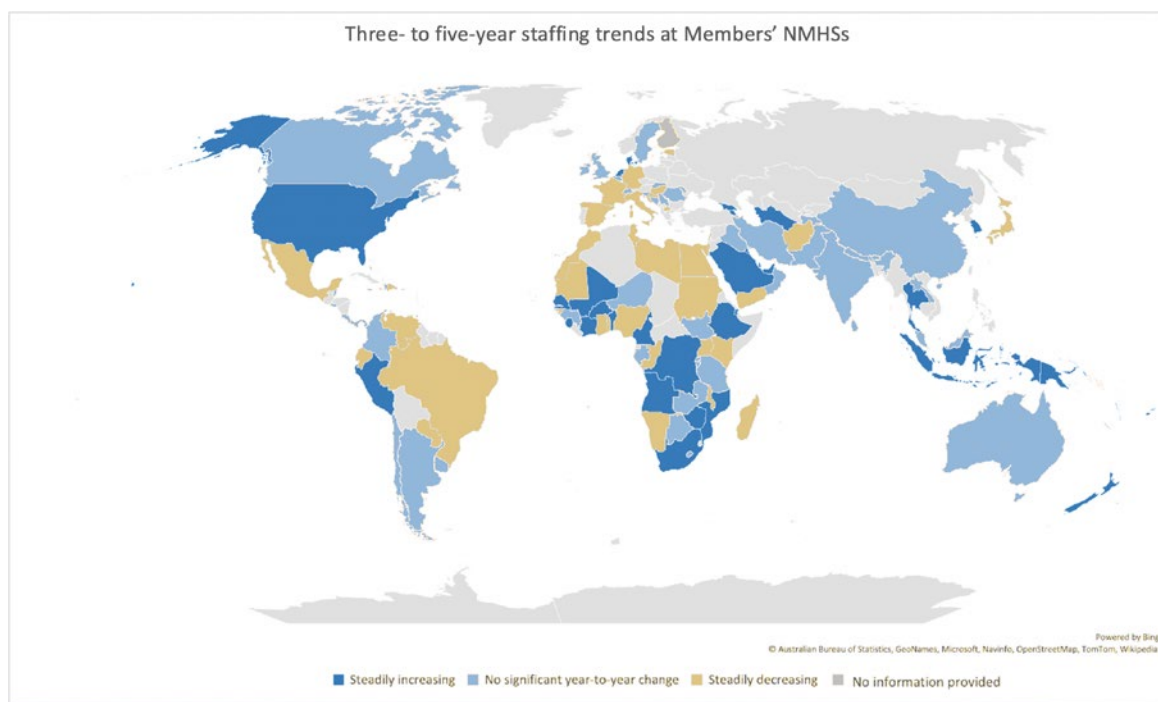
### **Map of three to five year NMHS staffing trends**

Map 9 shows the three- to five-year staffing trends of the respondents' NMHSs.

- Members that experienced a steadily increasing NMHS staffing trend in the three to five years prior to the 2021 survey are shaded dark blue.
- Members that experienced no significant year-to-year change in their NMHS staffing in the three to five years prior to the 2021 survey are shaded light blue.
- Members that experienced a steadily decreasing NMHS staffing trend in the three to five years prior to the 2021 survey are shaded yellow.
- Members that did not respond to the survey or that did provide information about their staffing trend are shaded pale grey.

The map shows that in the majority of the regions, the Members' NMHSs had diverse staffing trends in the three to five years prior to the 2021 survey.

The exception was Region V, as noted above. The consistent blue shading, and the lack of any yellow shading, of the Members of this region illustrates that all Region V respondents reported that their NMHS staff numbers either increased or remained stable in the three to five years prior to the survey.



**Map 9. Three- to five-year staffing trends at Members' NMHSs**

## 2.2 Capacity development

### 2.2.1 Number of staff in need of training, by professional category

#### 2.2.1.1 Number of staff

#### Major findings

- Worldwide, 90 000 people needed training in various professional areas in 2021 according to the 2021 survey respondents.
- The largest group of people needing training was Meteorological Technicians (36 085 people), followed by Managers (20 769 people), Climatologists (11 819 people) and Meteorologists (9 911 people).
- Large numbers of Researchers and Support Staff also needed training, as did as moderate numbers of Hydrologists and Customer Interactions and Communications Staff.
- The number of NMHS staff members globally who needed trained in 2021 (90 033) was higher than the number who needed training in 2017 (39 305), according to the respondents to the 2017 and 2021 surveys.
  - Most of this increase reflects the goals of Region II respondents. In 2017, Region II respondents reported that about 20 000 staff members needing training; in 2021, this number was almost 73 000.
  - The reported number of NMHS staff members needing training in Regions I, III, and V also increased from 2017 to 2021.
- The regions varied in their distributions of staff members needing training in 2021.
  - In Regions I, II, and III, for instance, 40% or more of the people who needed training were Meteorological Technicians.



- Region II placed a special emphasis on training Managers and Climatologists, who constituted 26% and 15% of those staff members needing training, respectively.
- In Regions IV and V, on the other hand, 40% or more of the people needing training were Meteorologists.
- In Region VI, the largest groups of staff members needing training were evenly balanced between Meteorological Technicians and Meteorologists, with both representing about 30% of those individuals in need of training. Region VI placed a special emphasis on training Researchers, who constituted 10% of those staff members needing training in that region.

### Detailed results

Table 32 shows the number of responses regarding the number of NMHS staff in need of training in each of eight professional categories. The professional categories are arranged in the table in the same order in which they were presented on the survey form.

**Table 32. Number of responses regarding the number of NMHS staff in need of training**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Manager	44	20	8	15	11	20	118
Meteorologist	45	23	9	16	11	21	125
Met Tech	45	23	7	17	10	20	122
Hydrologist	27	15	5	11	9	18	85
Climatologist	37	20	6	14	10	21	108
Researcher	32	17	5	10	8	18	90
Support Staff	40	17	8	14	9	20	108
Customer/Comms	37	14	6	10	8	20	95
Total no. of survey respondents	46	25	9	18	14	27	139

Table 32 shows that different numbers of respondents provided a response with respect to how many of their NMHS staff were in need of training in 2021 in the various professional categories. One reason for this may be that the respondents sometimes did not add zeros in the survey fields for professional categories in which they had no staff members in need of training.

Most survey respondents did provide a response with respect to the number of their NMHS staff who were in need of training in each professional category, however. About 120–125 respondents provided a response with respect to the categories of Manager, Meteorologist, and Meteorological Technician, 108 respondents provided a response with respect to the categories of Climatologist and Support Staff, and 85–95 respondents provided a response with respect to the categories of Hydrologist, Researcher, and Customer Interactions and Communications Staff.

Table 33 shows the regional and global numbers of NMHS staff that were in need of training in each professional category in 2021 according to the 2021 survey respondents. The table is sorted by the global total of staff members in need of training in each category, from highest to lowest.

**Table 33. Number of NMHS staff in need of training in each professional category in 2021, regionally and globally, according to the 2021 survey respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech	2 505	31 584	726	262	195	813	36 085
Manager	444	19 248	106	674	132	165	20 769
Climatologist	297	11 112	66	93	141	110	11 819
Meteorologist	1 295	4 706	299	2 363	502	746	9 911
Researcher	240	5 186	33	13	46	276	5 794
Support Staff	1 192	963	273	1 259	150	528	4 365
Hydrologist	170	58	94	292	18	90	722
Customer/Comms	198	96	46	81	50	97	568
Totals	6 341	72 953	1 643	5 037	1 234	2 825	90 033

Table 33 shows that, worldwide, 90 033 NMHS staff members were in need of training in the various professional categories in 2021 according to the 2021 survey respondents. The largest group was Meteorological Technicians (36 085 people), followed by Managers (20 769 people) and Climatologists (11 819 people).

In addition, 9 911 Meteorologists, 5 794 Researchers, 4 365 Support Staff, 722 Hydrologists, and 568 Customer Interactions and Communications Staff were also in need of training.

The regions varied in the numbers of staff members that were in need of training, from 1 234 in Region V to 72 953 in Region II.

Table 34. shows the regional and global numbers of staff in need in training in each professional category in 2017 according to the respondents to the 2017 survey. The table is sorted to match the 2021 sort order.

**Table 34. Number of staff in need of training in each professional category in 2017, regionally and globally, according to the 2017 survey respondents**

Professional category	Region						Global
	I	II	III	IV	V	VI	
Met Tech	2 119	6 922	506	960	236	1510	12 253
Manager	281	2 189	39	525	66	578	3 678
Climatologist	351	2 190	62	163	98	331	3 195
Meteorologist	1 068	3 983	344	2 639	263	1538	9 835
Researcher	199	3 187	247	302	54	475	4 464
Support Staff	545	503	150	530	61	1252	3 041
Hydrologist	86	140	50	307	26	115	724
Customer/Comms (not covered in the 2017 survey)							
Other (not covered in the 2021 survey)	276	232	17	742	26	219	1 512
Hydro Tech (not covered in the 2021 survey)	84	187	9	240	21	62	603
Totals	5 009	19 533	1 424	6 408	851	6 080	39 305

Tables 33 and 34 show that, according to the respondents to the surveys, higher numbers of NMHS staff members were in need of training in 2021 than in 2017. Globally, the number of staff members in need of training in 2021 was 90 033; in 2017, this number was 39 305.

Most of this increase reflects the goals of the Region II respondents. In 2017, Region II respondents reported that about 20 000 NMHS staff members were in need of training; in 2021, this number was almost 73 000.

The reported number of NMHS staff members in need of training in Regions I, III, and V also increased between 2017 and 2021.

Table 35 shows the percentages of NMHS staff in need of training in each region in each professional category in 2021, according to the survey respondents, and the average of the regional percentages.

**Table 35. Percentages of NMHS staff in need of training in each region in each professional category in 2021, according to the survey respondents, and average of the regional percentages**

Professional category	Region						Average of regional percentages
	I	II	III	IV	V	VI	
Met Tech	40%	43%	44%	5%	16%	29%	29%
Meteorologist	20%	6%	18%	47%	41%	27%	27%
Support Staff	19%	1%	17%	25%	12%	19%	16%
Manager	7%	26%	6%	13%	11%	6%	12%
Climatologist	5%	15%	4%	2%	11%	4%	7%
Researcher	4%	7%	2%	0.3%	4%	10%	4%
Hydrologist	3%	0.1%	6%	6%	1%	3%	3.2%
Customer/Comms	3%	0.1%	3%	2%	4%	4%	2.5%
Totals	100%	100%	100%	100%	100%	100%	100%

Table 35 shows that when the regional percentages are averaged, of the NMHS staff members that were in need of training globally, 29% were Meteorological Technicians, 27% were Meteorologists, 16% of were Support Staff, 12% were Managers, 7% were Climatologists, 4% were Researchers, 3% were Hydrologists, and 2.5% were Customer Interactions and Communications Staff.

The regions varied in their distributions of staff members that were in need of training.

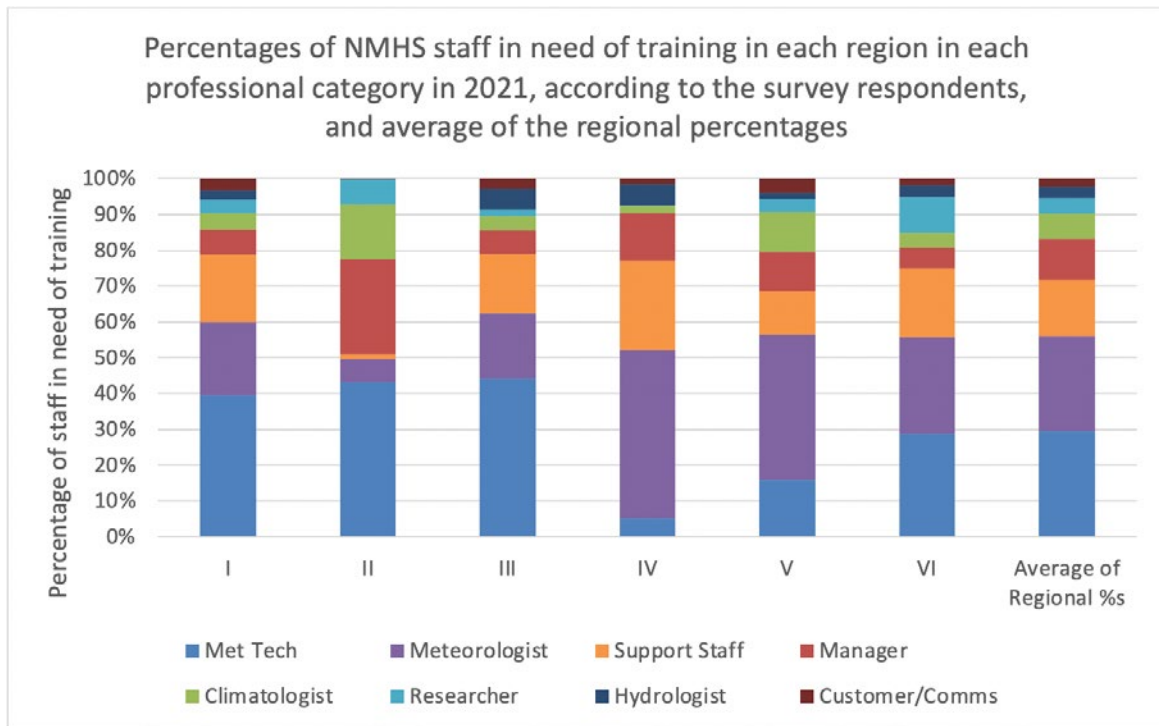
In Regions I, II, and III, for instance, 40% or more of the NMHS staff members in need of training were Meteorological Technicians.

Region II placed a special emphasis on training Managers and Climatologists, who constituted 26% and 15% of NMHS staff members in need of training, respectively.

In Regions IV and V, on the other hand, 40% or more of the NMHS staff in need of training were Meteorologists.

In Region VI, the largest groups of NMHS staff in need of training were evenly balanced between Meteorological Technicians and Meteorologists, with both representing about 30% of those individuals in need of training. Region VI placed a special emphasis on training Researchers, who constituted 10% of the NMHS staff in need of training in that region.

Figure 34 uses a bar graph to depict the same information that is presented in Table 34: the percentages of NMHS staff in need of training in each region in each professional category in 2021, according to the 2021 survey respondents, and the average of the regional percentages.



**Figure 34. Percentages of NMHS staff in need of training in each region in each professional category in 2021, according to the survey respondents, and average of the regional percentages**

The large blue and purple segments at the bottom of each bar show that in all regions, and globally, Meteorological Technicians and Meteorologists constituted at least half of all NMHS staff members in need of training. This is logical, as half of the global NMHS workforce consists of staff members in these two professional categories.

The relative size of the blue and purple segments also shows the difference in the emphasis the various regions placed on training for Meteorological Technicians and Meteorologists.

For example, for Region II, the blue segment is much larger than the purple segment. This reflects the fact that in Region II, 43% of the NMHS staff that were in need of training in 2021 were Meteorological Technicians, while only 6% were Meteorologists.

The opposite is true for Region IV: the purple segment is much larger than the blue segment. This reflects the fact that in Region II, only 5% of the NMHS staff that were in need of training in 2021 were Meteorological Technicians, while 47% were Meteorologists.

For Region VI, the blue and purple segments are about the same size: Meteorological Technicians and Meteorologists each constituted about 30% of the people that were in need of training in 2021.

The stacked segments in Figure 34 also make it easy to see the special emphasis the regions placed on certain professional categories. For example, in the Region II bar, the red and pale green segments depict the large percentages of Managers and Climatologists, and the very narrow orange segment depicts the relatively small percentage of Support Staff in need of training in that region. As another example, the pale blue bar near the top of the Region VI bar illustrates the special emphasis placed on training Researchers in that region.

### **Maps: Numbers of Meteorological Technicians and Meteorologists in need of training in 2021 according to the survey respondents**

Map 10 shows the number of Meteorological Technicians who were in need of training in 2021 according to the survey respondents.

The map is coloured on a gradient from very pale blue to dark blue.

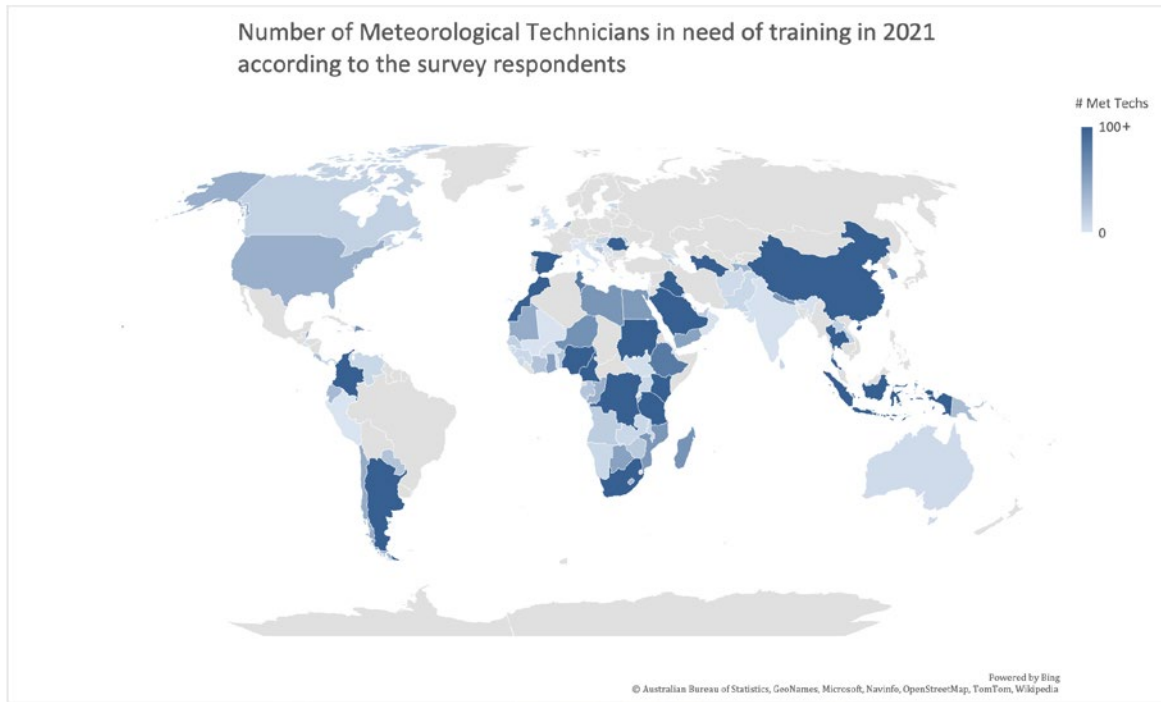
- The Members whose NMHSs had the lowest numbers of Meteorological Technicians that were in need of training in 2021 are shaded very pale blue. The minimum number according to the 2021 survey respondents was zero.
- The Members whose NMHSs had the highest numbers of Meteorological Technicians that were in need of training in 2021 are shaded dark blue. The highest number according to the 2021 survey respondents was over 100 (“100+”). Eighteen survey respondents indicated that over 100 Meteorological Technicians in their NMHSs were in need of training in 2021.
- The Members whose NMHSs had between zero and one hundred Meteorological Technicians in need of training in 2021 are coloured in gradually changing hues of blue.
- The Members whose survey respondents did not share information on this topic or that did not report their numbers of Meteorological Technicians that were in need of training in 2021 are shaded pale grey.

Map 11 shows the number of Meteorologists who were in need of training in 2021 according to the survey respondents.

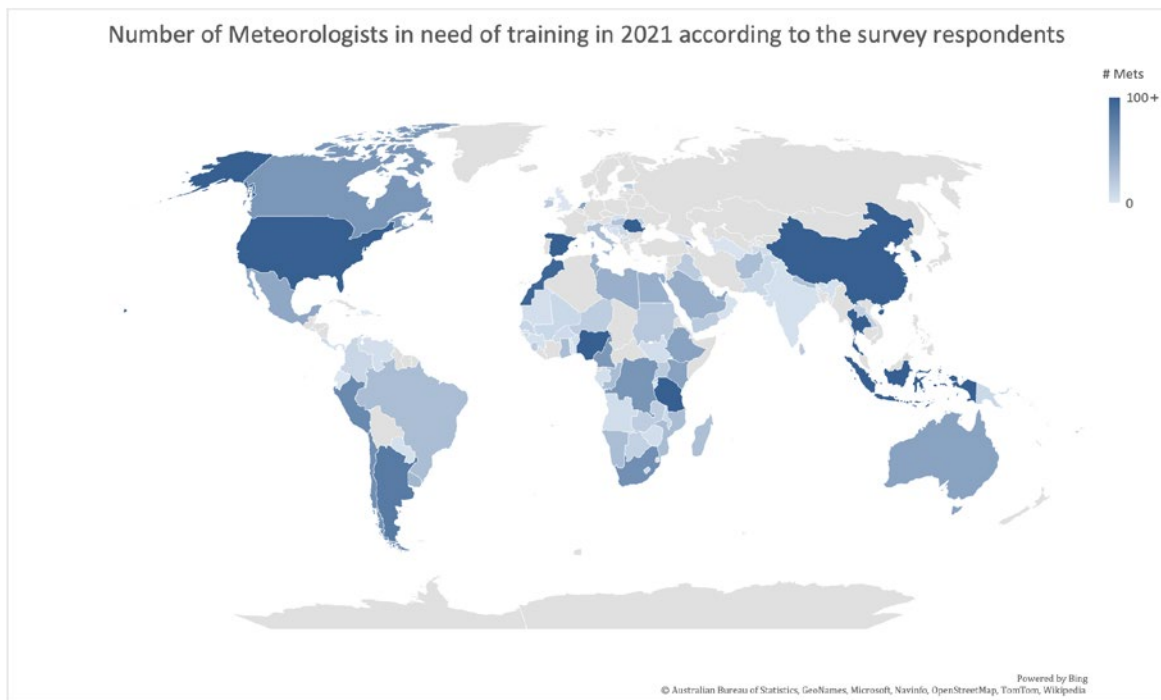
The map is coloured in the same manner as Map 10:

- The Members whose NMHSs had the lowest numbers of Meteorologists that were in need of training in 2021 are shaded very pale blue. The minimum number according to the 2021 survey respondents was zero.
- The Members whose NMHSs had the highest numbers of Meteorologists that were in need of training in 2021 are shaded dark blue. The highest number according to the 2021 survey respondents was over 100 (“100+”). Nine survey respondents indicated that over 100 Meteorologists in their NMHSs were in need of training in 2021.
- The Members whose NMHSs had between zero and one hundred Meteorologists in need of training in 2021 are coloured in gradually changing hues of blue.
- The Members whose survey respondents did not share information on this topic or that did not report their numbers of Meteorologists that were in need of training in 2021 are shaded pale grey.

Maps 10 and 11 show that Members within the various regions varied widely with respect to the numbers of Meteorological Technicians and Meteorologists in their NMHSs that were in need of training in 2021, according to the survey respondents.



**Map 10. Number of Meteorological Technicians in need of training in 2021 according to the survey respondents**



**Map 11. Number of Meteorologists in need of training in 2021 according to the survey respondents**

### 2.2.1.2 Priority levels for the needed training

#### Major findings

- For three professional categories: Meteorological Technicians, Meteorologists, and Climatologists, the priority level for the training needed by most of the staff members was moderate or high.
  - For all regions, the priority level for the training needed by at least 82% of Meteorological Technicians was moderate or high. When the regional percentages were averaged, the global percentage of those Meteorological Technicians whose training was given a priority level of moderate or high was 88%.
  - For five of the six regions, the priority level for the training needed by at least 88% of Meteorologists was moderate or high (for the remaining region, the percentage was 71%). When the regional percentages were averaged, the global percentage of those Meteorologists whose training was given a priority level of moderate or high was 89%.
  - For all regions, the priority level for the training needed by at least 80% of Climatologists was moderate or high. When the regional percentages were averaged, the global percentage of those Climatologists whose training was given a priority level of moderate or high was 86%.
  - Globally, the priority level for the training needed by NMHS staff in these three professional categories was high for 61% of Meteorologists, 58% of Meteorological Technicians and 58% of Climatologists.
- For the other five professional categories covered in the 2021 survey, the global percentage of staff members whose training was given a priority level of moderate or high ranged from 67% to 79%.
  - The priority level for the training needed by NMHS staff was high for 46% of Hydrologists, 42% of Customer Interactions and Communications Staff, 34% of Researchers, 32% of Managers, and 19% of Support Staff.

#### Detailed findings

Figures 35 through 38 show the priority levels for the training needed for NMHS staff in the professional categories of Meteorological Technician, Meteorologist, Support Staff, Manager, Climatologist, Researcher, Customer Interactions and Communications Staff and Hydrologist. The bar charts show the percentage of Members in each region that classified those priority levels as high, medium, or low for their NMHS staff in each professional category. The global priority levels represent the average of the regional percentages.

The percentages were calculated based on the number of respondents that indicated the numbers of their NMHS staff in need of training in each professional category. (Some of the respondents indicated that a certain number of their NMHS staff were in need of training in a specific professional category, but they did not assign a priority level to that training.)

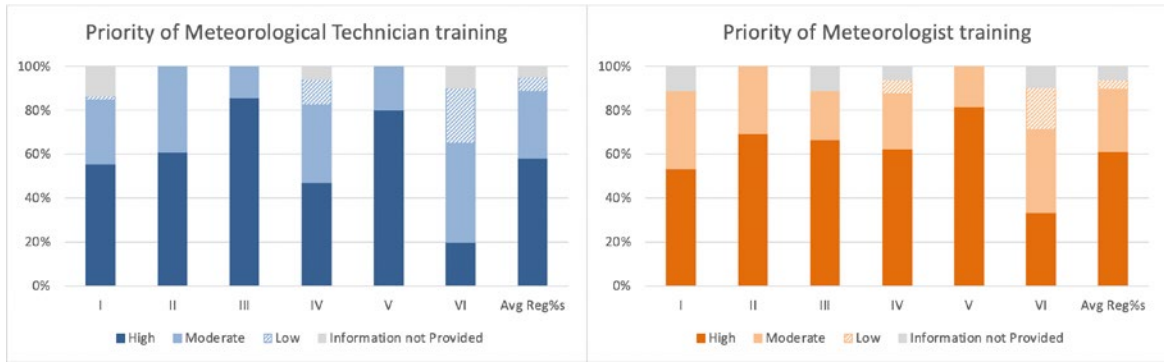


Figure 35. Priority of the training needed for Meteorological Technicians and Meteorologists

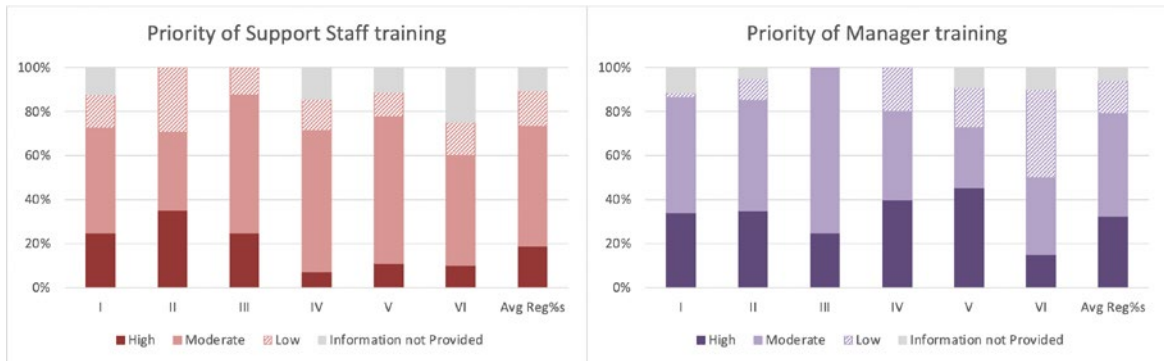


Figure 36. Priority of the training needed for Support Staff and Managers

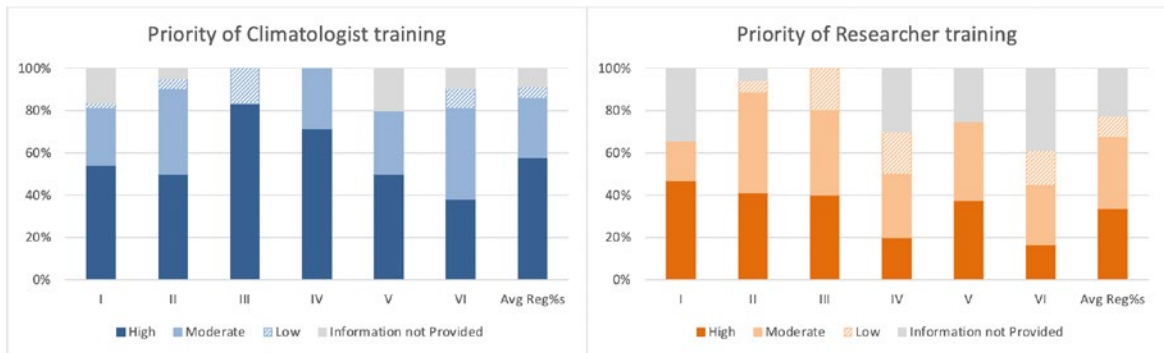
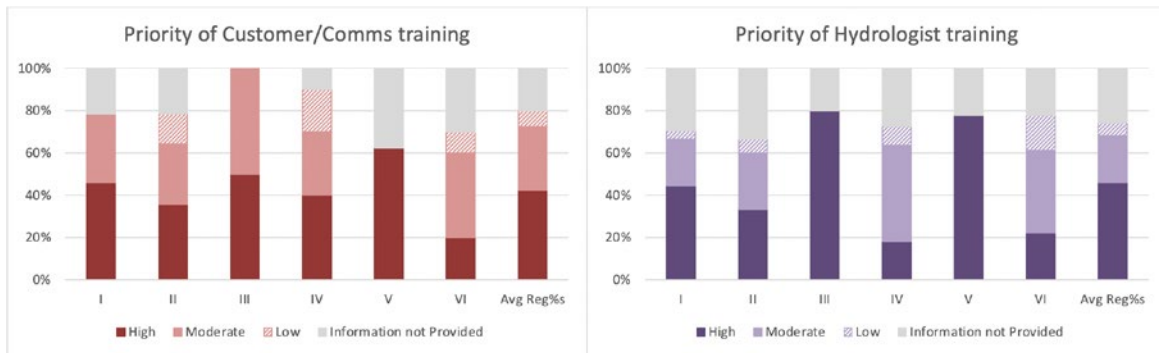


Figure 37. Priority of the training needed for Climatologists and Researchers





**Figure 38. Priority of the training needed for Customer Interactions and Communications Staff and Hydrologists**

In Figures 35 through 38:

The dark-coloured segments in each bar represent the percentage of Members that indicated that the training priority for their NMHS staff in the given professional category was high.

The medium-coloured segments in each bar represent the percentage of Members that indicated that the training priority for their NMHS staff in the given professional category was moderate.

The segments with narrow stripes in each bar represent the percentage of Members that indicated that the training priority for their NMHS staff in the given professional category was low.

The pale grey segments in each bar represent the percentage of Members that indicated that their NMHS staff was in need of training in the given professional category but did not indicate a specific priority level for that training.

#### *Meteorological Technicians*

The chart with blue bars in Figure 35 shows the levels of priority for the training that was needed by those Meteorological Technicians who were in need of training in 2021 according to the survey respondents.

In the far right bar, the dark blue segment shows that worldwide, the priority level for the training needed by 58% of those Meteorological Technicians who were in need of training was high. (The worldwide percentage was calculated as the average of the regional percentages.)

The medium blue segment shows that worldwide, the priority level for the training needed by 30% of those Meteorological Technicians who were in need of training was moderate.

The segment with narrow stripes shows worldwide, the priority level for the training needed by 6% of those Meteorological Technicians who were in need of training was low, and the pale grey segment shows that the respondents did not assign a level of priority for the training needed by 5% of those Meteorological Technicians who were in need of training.

The regions varied widely with respect to the percentage of Meteorological Technicians whose needed training had a priority level of high, from a low of 20% in Region VI to a high of 86% in Region III. The percentage of Meteorological Technicians whose needed training had a priority level of moderate ranged from a low of 14% in Region III to a high of 45% in Region V.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 82% of those Meteorological Technicians who were in need of training.

In Region III and Region V, in particular, the survey respondents classified the needed training as a high priority for at least 80% of those Meteorological Technicians who were in need of training.

In Regions II, III, and V, the survey respondents classified the needed training as at least a moderate priority for all of those Meteorological Technicians who were in need of training.

#### *Meteorologists*

The chart with orange bars in Figure 35 shows the levels of priority for the training that was needed by those Meteorologists who were in need of training in 2021 according to the survey respondents.

In the far right bar, the dark orange segment shows that worldwide, the priority level for the training needed by 61% of those Meteorologists who were in need of training was high. (The worldwide percentage was calculated as the average of the regional percentages.)

The medium orange segment shows that worldwide, the priority level for the training needed by 28% of those Meteorologists who were in need of training was moderate.

The segment with narrow stripes shows that worldwide, the priority level for the training needed by 4% of those Meteorologists who were in need of training was low, and the pale grey segment shows that the respondents did not assign a level of priority for the training needed by 6% of those Meteorologists who were in need of training.

The regions varied with respect to the percentage of Meteorologists whose needed training had a priority level of high, from a low of 33% in Region VI to a high of 82% in Region V. The percentage of Meteorologists whose needed training had a priority level of moderate ranged from a low of 18% in Region III to a high of 38% in Region VI.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 71% of those Meteorologists who were in need of training.

In Region V, the survey respondents classified the priority level of the needed training as high for 82% of those Meteorologists who were in need of training, and in Regions II and V, the survey respondents classified the priority level of the needed training as at least moderate for all of the Meteorologists who were in need of training.

#### *Support Staff*

The chart with red bars in Figure 36 shows the levels of priority for the training that was needed by those Support Staff who were in need or training in 2021 according to the survey respondents.

In the far right bar, the dark red segment shows that worldwide the priority level for the training needed by 19% of those Support Staff who were in need of training was high. (The worldwide percentage was calculated as the average of the regional percentages.)

The medium red segment shows that worldwide, the priority level for the training needed by 54% of those Support Staff in need of training worldwide was moderate.

The segment with narrow stripes shows that worldwide, the priority level for the training needed by 16% of those Support Staff who were in need of training was low, and the pale grey segment shows that the respondents did not assign a level of priority for the training needed by 10% of those Support Staff who were in need of training.

The regions varied with respect to the percentage of Support Staff whose needed training had a priority level of high, from a low of 7% in Region IV to a high of 35% in Region II. The percentage of Support Staff whose needed training had a priority level of moderate ranged from 35% in Region II to 67% in Region V.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 70% of those Support Staff who were in need of training.

### *Managers*

The chart with purple bars in Figure 36 shows the levels of priority for the training that was needed by those Managers who were in need of training in 2021 according to the survey respondents.

In the far right bar, the dark purple segment shows that worldwide, the priority level for the training needed by 32% of those Managers who were in need of training was high. (The worldwide percentage was calculated as the average of the regional percentages.)

The medium red segment shows that worldwide, 47% of those Managers who were in need of training was moderate.

The segment with narrow stripes shows that worldwide, the priority level for the training needed by 15% of those Support Staff who were in need of training was low, and the pale grey segment shows that the respondents did not assign a level of priority for the training needed by 6% of those Support Staff who were in need of training.

The regions varied with respect to the percentage of Managers whose needed training had a priority level of high, from a low of 15% in Region VI to a high of 45% in Region V. The percentage of Managers whose needed training had a priority level of moderate ranged from a low of 27% in Region V to a high of 75% in Region III.

In Region III, the priority level for the needed training for all of the Managers in need of training was moderate or high.

### *Climatologists*

The chart with blue bars in Figure 37 shows that when the regional priority levels were averaged, worldwide, the priority level for the training needed by 58% of those Climatologists who were in need of training was high, and the priority level for 28% of those Climatologists who were in need of training was moderate.

The regions varied with respect to the percentage of Climatologists whose needed training had a priority level of high, from a low of 38% in Region VI to a high of 83% in Region III. The percentage of Climatologists whose needed training had a priority level of moderate ranged from a low of 0% in Region III to a high of 43% in Region VI.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 80% of those Climatologists who were in need of training.

### *Researchers*

The chart with orange bars in Figure 37 shows that when the regional priority levels were averaged, worldwide, the priority level for the training needed by 34% of those Researchers who were in need of training was high, and the priority level for the training needed by 34% of those Researchers who were in need of training was moderate.

The regions varied with respect to the percentage of Researchers whose needed training had a priority level of high, from a low of 17% in Region VI to a high of 47% in Region I. The percentage of Researchers whose needed training had a priority level of moderate ranged from a low of 19% in Region I to a high of 47% in Region II.

In Regions II, III, and V, in particular, the survey respondents classified the needed training as moderate or high priority for at least 75% of those Researchers who were in need training.

### *Customer Interactions and Communications Staff*

The chart with red bars in Figure 38 shows that when the regional priority levels were averaged, worldwide, the priority level for the training needed by 42% of those Customer Interactions and

Communications Staff in need of training was high, and the priority level for the training needed by 30% of those Customer Interactions and Communications Staff who were in need of training was moderate.

The regions varied with respect to the percentage of Customer Interactions and Communications Staff whose needed training had a priority level of high, from a low of 20% in Region VI to a high of 63% in Region V. The percentage of these staff whose needed training had a priority level of moderate ranged from a low of 0% in Region V to a high of 50% in Region III.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 60% of those Customer Interactions and Communications Staff who were in need of training. In Region III, the survey respondents classified the needed training as at least a moderate priority for all of those Customer Interactions and Communications Staff who were in need of training. In Region V, the survey respondents classified the needed training as high priority for all of those Customer Interactions and Communications Staff who were in need of training.

#### *Hydrologists*

The chart with purple bars in Figure 38 shows that when the regional priority levels were averaged, worldwide, the priority level for the training needed by 46% of those Hydrologists that were in need of training was high and the priority level for the training needed by 22% of those Hydrologists who were in need of training was moderate.

The regions varied with respect to the percentage of Hydrologists whose needed training had a priority level of high, from a low of 18% in Region IV to a high of 80% in Region III. The percentage of Hydrologists whose needed training had a priority level of moderate ranged from a low of 0% in Region III and Region V to a high of 45% in Region IV.

In all of the regions, the survey respondents classified the needed training as moderate or high priority for at least 60% of those Hydrologists who were in need of training.

In Regions III and V, the survey respondents classified the needed training as high priority for all of those Hydrologists who were in need of training.

### 2.2.2 ***Number of experts expected to be trained***

#### **Major findings**

- Globally, the 2021 survey respondents expected that 15 995 experts would receive training during 2021; the 2017 survey respondents, in comparison, expected that 19 191 experts would receive training in 2017. (It is logical that the smaller group of 2021 survey respondents would expect fewer experts to receive training during the year of the survey than did the larger 2017 group.)
- Although the reported number of experts for whom training was anticipated during the year of the survey was smaller in 2021 than in 2017 globally, it was higher in 2021 than in 2017 for experts in Regions II and V.
- While an anticipated funding source could be confirmed for only about half of the experts worldwide for whom training was expected according to the respondents to the 2021 survey, more thorough results were obtained for some of the regions. These results show that the sources of anticipated funding have changed in different ways across the various regions.
  - For example, the number of experts for whose training government funding was expected diminished dramatically in Region IV from 2017 to 2021, while this number increased in Region V.

- In addition, in several regions, the respondents anticipated that project funds and other scholarships would play a greater role in funding the experts' training in 2021 than they did in 2017.

### Detailed results

Table 36 shows the number of responses regarding the number of experts expected to be trained in 2021.

**Table 36. Number of responses regarding the number of experts expected to be trained in 2021**

	Region						Global
	I	II	III	IV	V	VI	
Number of respondents that shared information about the number of experts expected to be trained in 2021	42	24	7	17	14	21	125
Total no. of survey respondents	46	25	9	18	14	27	139

Of the 139 respondents to the survey, 125 shared information about the number of their experts expected to be trained in 2021. All of the Members of Region V that responded to the survey shared information on this topic. All but one or two of the Members of Regions II, III, and IV that responded to the survey shared information on this topic. Four respondents from Region I and six respondents from Region VI did not share information on this topic.

Table 36 shows the total number of experts expected to be trained worldwide and in each region in 2021 according to the respondents to the 2021 survey. Table 37 shows the same information for 2017 according to the respondents to the 2017 survey.

**Table 37. Total number of experts expected to be trained in 2021 according to the 2021 survey respondents**

	Region						Global
	I	II	III	IV	V	VI	
Total number of experts expected to be trained	2 551	8 817	861	1 405	1 245	1 116	15 995

**Table 38. Total number of experts expected to be trained in 2017 according to the 2017 survey respondents**

	Region						Global
	I	II	III	IV	V	VI	
Total number of experts expected to be trained	3 101	5 046	846	4 734	1 035	4 429	19 191

Tables 37 and 38 show that the 2021 survey respondents anticipated that 15 995 experts would receive training in 2021; the 2017 survey respondents, in comparison, anticipated that 19 191 experts would receive training in 2017.

Overall, the reported number of experts for whom training was anticipated was lower in 2021 than in 2017; however, for two regions the situation was the reverse. The Region II respondents anticipated that 8 817 experts would receive training in 2021, compared to 5 046 in 2017, and the Region V respondents anticipated that 1 245 experts would receive training in 2021, compared to 1 035 in 2017.

The Region I respondents anticipated that 2 551 experts would receive training in 2021, compared to 3 101 in 2017.

The Region III respondents anticipated that 861 experts would receive training in 2021, compared to 846 in 2017.

The Region IV respondents anticipated that 1 405 experts would receive training in 2021, compared to 4 734 in 2017. The difference in these figures reflects the much smaller numbers reported by the Region IV respondents to the 2021 survey compared to the numbers reported by the respondents from the same region to the 2017 survey.

The Region VI respondents anticipated that 1 116 experts would receive training in 2021, which is a substantially lower number than the 4 429 experts the Region VI respondents anticipated would receive training in 2017. The difference in these figures is a result of some Region VI Members having responded to the 2017 survey but not to the 2021 survey, and of some Region VI Members reporting smaller numbers in 2021 than they did in 2017.

The survey question about this topic asked Members to indicate the number of experts expecting training support from government sources, project funds, WMO, and other scholarships.

While 125 survey respondents submitted information regarding the number of their experts for whom training was anticipated in 2021, a database error made it necessary for WMO to ask Members to confirm these numbers by funding source. Table 39 shows the distribution of the original and confirmed responses by region.

**Table 39. Number of responses regarding the number of experts expected to be trained in 2021**

	<i>Region</i>						<i>Global</i>
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>VI</i>	
Number of respondents that shared information about the no. of experts expected to be trained in 2021	42	24	7	17	14	21	125
Number of respondents that confirmed this information	20	20	4	13	11	16	84
Total no. of survey respondents	46	25	9	18	14	27	139

The 84 responses that confirmed the number of experts expected to be trained in 2021 were used to analyse expectations concerning training funding sources.

It is important to note that while many of the respondents from Regions II, IV, V, and VI confirmed the information they initially provided regarding the number of experts that were expected to be trained in 2021, only about half of the respondents from Regions I and III did so. This is something to keep in mind when considering the results concerning the expectations of each region with respect to the funding support for the expected training.

Table 40 shows the number of experts who were expected to be trained in 2021 through the support of the given funding sources, as confirmed by the 2021 survey respondents.

**Table 40. Number of experts who were expected to be trained in 2021 through the support of the given funding sources, as confirmed by the 2021 survey respondents**

Funding source	Region						Global
	I	II	III	IV	V	VI	
Government	985	1 784	322	129	1 054	290	4 564
Project funding	319	262	180	53	110	130	1 054
WMO	217	399	89	44	65	100	914
Other	106	38	197	67	12	41	461
Total confirmed by funding source	1 627	2 483	788	293	1 241	561	6 993
Total number of experts expected to be trained	2 551	8 817	861	1405	1 245	1 116	15 995

Table 40 shows that in 2021, 6 993 experts were represented in the Members' 84 confirmed responses. (See the last column in the "Total confirmed by funding source" row.)

Globally, the number of experts for whom the respondents confirmed a funding source was less than half of the total number of experts who were expected to be trained in 2021.

Table 41 shows the percentage of experts who were expected to be trained in 2021 through the support of the given funding sources, as confirmed by the 2021 survey respondents.

**Table 41. Percentage of experts who were expected to be trained in 2021 through the support of the given funding sources, as confirmed by the 2021 survey respondents**

Funding source	Region						Global
	I	II	III	IV	V	VI	
Government	61%	72%	41%	44%	85%	52%	65%
Project funding	20%	11%	23%	18%	9%	23%	15%
WMO	13%	16%	11%	15%	5%	18%	13%
Other	7%	2%	25%	23%	1%	7%	7%
Total	100%	100%	100%	100%	100%	100%	100%

Table 42 shows the number of experts who were expected to be trained in 2017 through the support of the given funding sources, according to the 2017 survey respondents.

Table 43 shows the percentage of experts who were expected to be trained in 2017 through the support of the given funding sources, according to the 2017 survey respondents.

**Table 42. Number of experts who were expected to be trained in 2017 through the support of the given funding sources, according to the 2017 survey respondents**

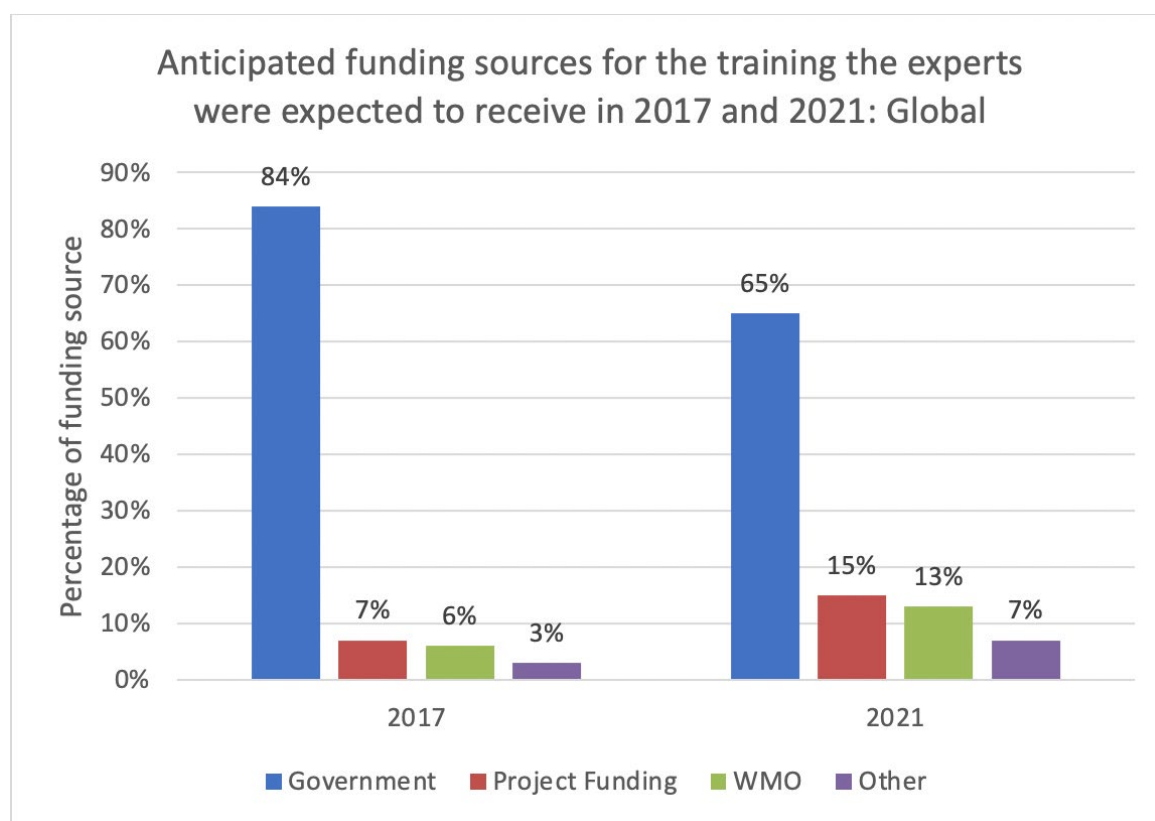
Funding source	Region						Global
	I	II	III	IV	V	VI	
Government	1 966	4 047	458	4 603	898	4 100	16 072
Project funding	401	606	194	28	45	147	1 421
WMO	518	264	135	87	62	96	1 162
Other	216	129	59	16	30	86	536
Total number of experts	3 101	5 046	846	4 734	1 035	4 429	19 191

**Table 43. Percentage of experts who were expected to be trained in 2017 through the support of the given funding sources, according to the 2017 survey respondents**

Funding source	Regions						Global
	I	II	III	IV	V	VI	
Government	63%	80%	54%	97%	87%	93%	84%
Project funding	13%	12%	23%	1%	4%	3%	7%
WMO	17%	5%	16%	2%	6%	2%	6%
Other	7%	3%	7%	0.30%	3%	2%	3%
Total	100%	100%	100%	100%	100%	100%	100%

**Global**

Figure 39 shows the anticipated funding sources for the training the experts were expected to receive in 2017 and 2021 globally, according to the 2017 and 2021 survey respondents.

**Figure 39. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Global**

Globally, the 2021 survey respondents expected that 15 995 experts would receive training in 2021; the 2017 survey respondents, in comparison, expected that 19 191 experts would receive training in 2017. (See Tables 40 and 42.) These overall results mostly reflect the different sets of WMO Members represented in the two surveys, rather than changes in the Members' training policies.

The respondents were unable to confirm an anticipated funding source for the training expected for many of their experts in 2021. Of the 15 995 experts who were expected to receive training in 2021, the respondents were able to confirm the anticipated funding source for only 6 993, or 44%. (See Table 40.)



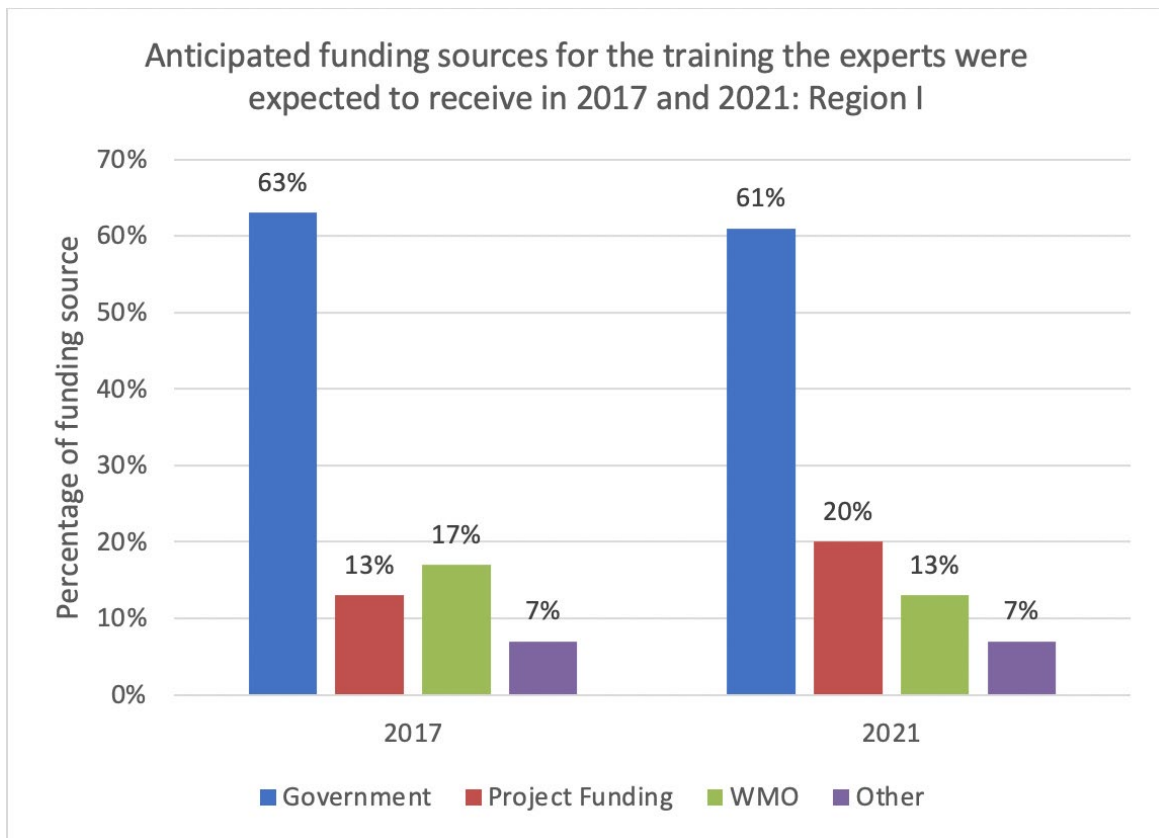
Specifically, the 2021 survey respondents were able to confirm that, of the experts expected to receive training in 2021, it was anticipated that 4 564 (65%) would receive training supported by government funding, 1 054 (15%) would receive training supported by project funding, 914 (13%) would receive training supported by WMO funding, and 461 (7%) would receive training supported by other funding sources.

In comparison, according to the 2017 survey respondents, of the experts expected to receive training in 2017, it was anticipated that 16 072 (84%) would receive training supported by government funding, 1 421 (7%) would receive training supported by project funding, 1 162 (6%) would receive training supported by WMO funding, and 536 (3%) would receive training supported by other funding sources.

Since an anticipated funding source could not be confirmed for the training expected for half of the experts globally in 2021, a comparison with the anticipated funding sources for the training expected for the experts in 2017 is only moderately meaningful. As is to be expected, the confirmed numbers of experts expected to receive training through the support of an anticipated funding source were lower for all four funding sources in 2021 than they were in 2017.

**Region I**

Figure 40 shows the anticipated funding sources for the training the experts in Region I were expected to receive in 2017 and 2021, according to the 2017 and 2021 survey respondents.



**Figure 40. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region I**

The 2021 survey respondents expected that 2 551 Region I experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 3 101 Region I experts would receive training in 2017. This represents a decrease of 18% between the 2017 and 2021 figures. (See Tables 40 and 42.)

The respondents were unable to confirm an anticipated funding source for the training expected for some of their experts in 2021. Of the 2 551 experts who were expected to receive training in 2021, the respondents were able to confirm the anticipated funding source for 1 627, or 64%. (See Table 40.)

Specifically, the 2021 survey respondents were able to confirm that, of the Region I experts expected to receive training in 2021, it was anticipated that 985 (61%) would receive training supported by government funding, 319 (20%) would receive training supported by project funding, 217 (13%) would receive training supported by WMO funding, and 106 (7%) would receive training supported by other funding sources.

According to the 2017 survey respondents, of the Region I experts expected to receive training in 2017, it was anticipated that 1 966 (63%) would receive training supported by government funding, 401 (13%) would receive training supported by project funding, 518 (17%) would receive training supported by WMO funding, and 216 (7%) would receive training supported by other funding sources.

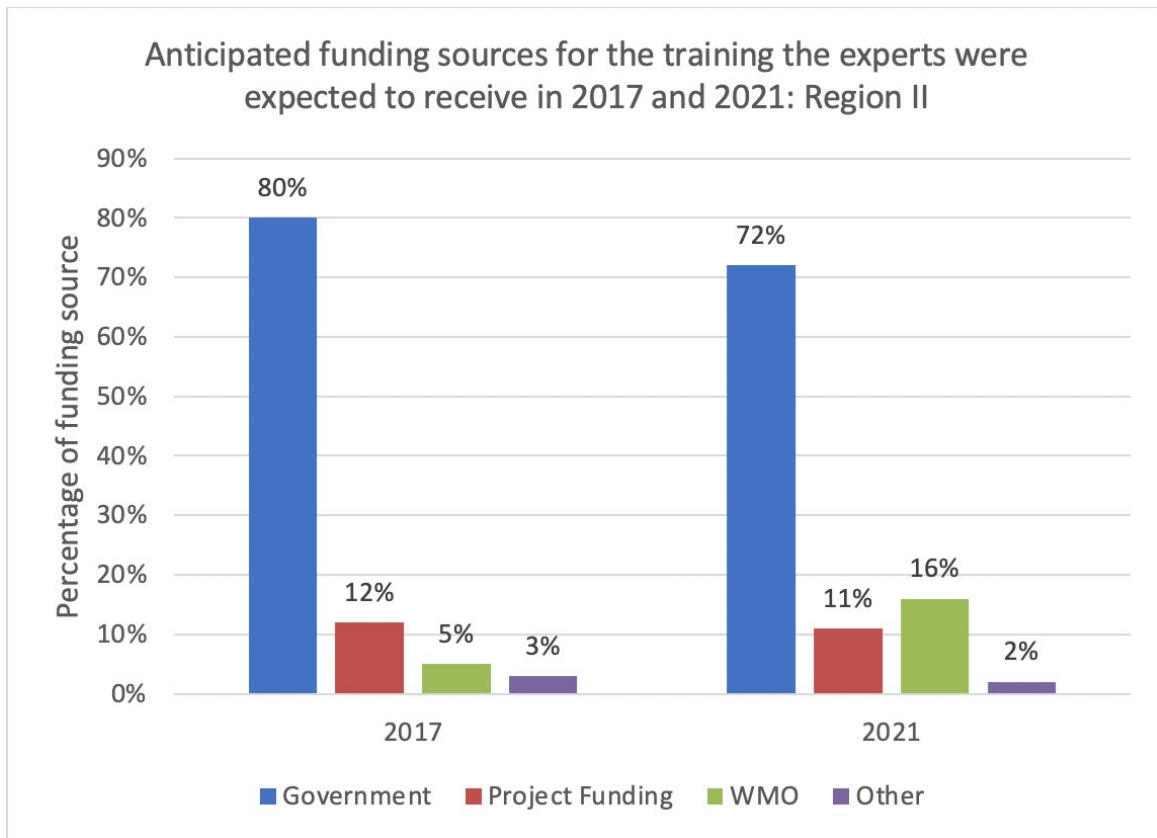
Since an anticipated funding source could not be confirmed for the training expected for one third of Region I's experts in 2021, a comparison with the anticipated funding sources for the training expected for the experts in 2017 is only moderately meaningful. As is to be expected, the confirmed numbers of experts expected to receive training through the support of an anticipated funding source were lower for all four sources in 2021 than they were in 2017.

Nonetheless, the percentages of experts expected to receive training through the support of each anticipated funding source were similar in 2021 to the percentages reported in 2017. For instance, of the Region I experts expected to receive training in 2021, it was anticipated that 61% would receive training supported by government funding; in 2017, this percentage was anticipated to be 63%. The percentages were identical with respect to the Region I experts expected to receive training supported by other funding sources: it was anticipated that this percentage would be 7% in both 2021 and 2017.

It was also anticipated that 20% of the Region I experts expected to receive training in 2021 would be supported by project funding, compared to an anticipated percentage of 13% in 2017, and it was anticipated that 13% of the Region I experts expected to receive training in 2021 would be supported by WMO funding, compared to an anticipated percentage of 17% in 2017.

## **Region II**

Figure 41 shows the anticipated funding sources for the training the experts in Region II were expected to receive in 2017 and 2021.



**Figure 41. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region II**

Region II is one of the regions in which more experts were expected to receive training in 2021 than in 2017. The 2021 survey respondents expected that 8 817 Region II experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 5 046 Region II experts would receive training in 2017. This represents an increase of 43% between the 2017 and 2021 figures. (See Tables 40 and 42.)

The respondents were unable to confirm an anticipated funding source for the training expected for most of their experts in 2021. Of the 8 817 experts who were expected to receive training in 2021, the respondents were only able to confirm the anticipated funding source for 2 483, or 28%. (See Table 42.)

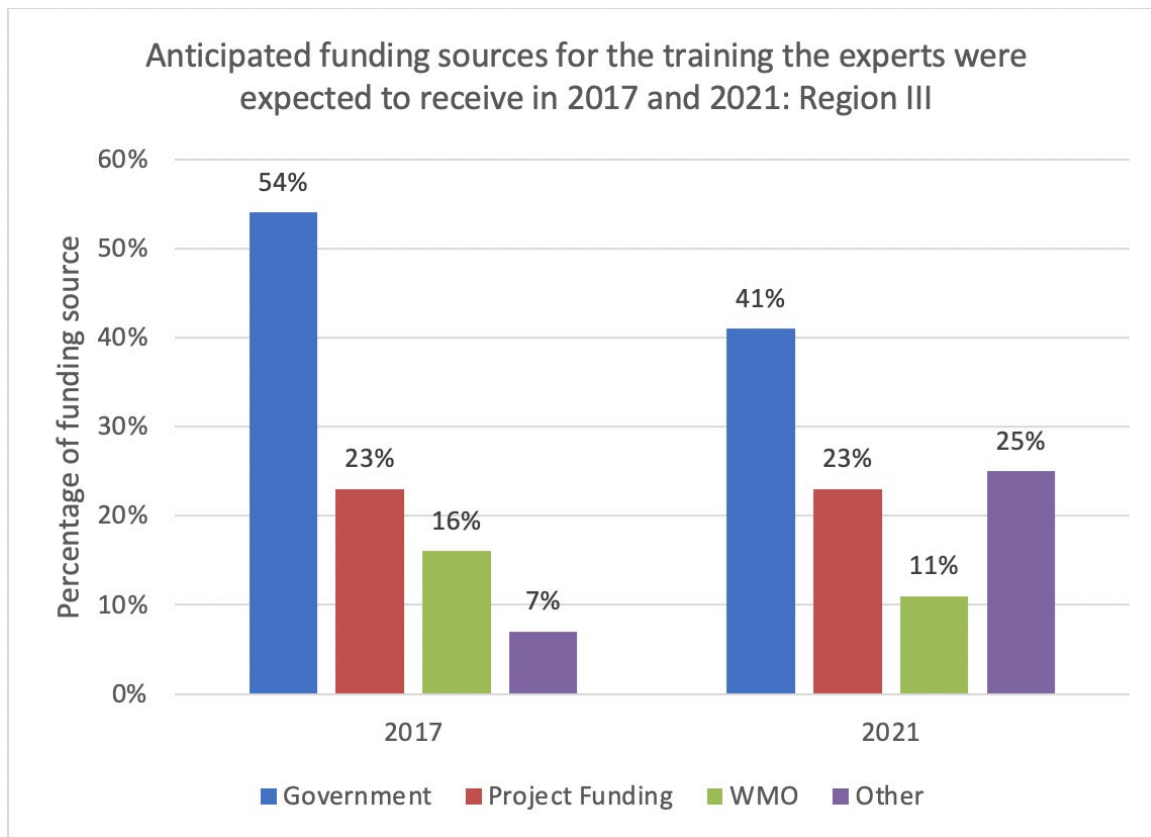
Specifically, the 2021 survey respondents were able to confirm that, of the Region II experts expected to be trained in 2021, it was anticipated that 1 784 (72%) would receive training supported by government funding, 262 (11%) would receive training supported by project funding, 399 (16%) would receive training supported by WMO funding, and 38 (2%) would receive training supported by other funding sources.

According to the 2017 survey respondents, of the Region II experts expected to receive training in 2017, it was anticipated that 4 047 (80%) would receive training supported by government funding, 606 (12%) would receive training supported by project funding, 264 (5%) would receive training supported by WMO funding, and 129 (3%) would receive training supported by other funding sources.

Since an anticipated funding source could not be confirmed for more than two thirds of Region II's experts in 2021, a comparison with the anticipated funding sources for the training expected for the experts in 2017 is not meaningful. As is to be expected, the confirmed numbers of experts expected to receive training through the support of an anticipated funding source were lower for all four sources in 2021 than they were in 2017.

### Region III

Figure 42 shows the anticipated funding sources for the training the experts in Region III were expected to receive in 2017 and 2021, according to the 2021 and 2017 survey respondents.



**Figure 42. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region III**

The 2021 survey respondents expected that 861 Region III experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 846 Region III experts would receive training in 2017. This represents a slight increase of 2% between the 2017 and 2021 figures. (See Tables 39 and 41.)

Of the 861 experts who were expected to receive training in 2021, the respondents were able to confirm the anticipated funding source for 788, or 92%. (See Table 40.)

Specifically, the 2021 survey respondents were able to confirm that, of the Region III experts expected to receive training in 2021, it was anticipated that 322 (41%) would receive training supported by government funding, 180 (23%) would receive training supported by project funding, 89 (11%) would receive training supported by WMO funding, and 197 (25%) would receive training supported by other funding sources.

In comparison, according to the 2017 survey respondents, of the Region III experts expected to receive training in 2017, it was anticipated that 458 (54%) would receive training supported by government funding, 194 (23%) would receive training supported by project funding, 135 (16%) would receive training supported by WMO funding, and 59 (7%) would receive training supported by other funding sources.

Although the number of experts for whom training was expected was almost identical in 2021 and 2017, the sources of their anticipated funding changed.

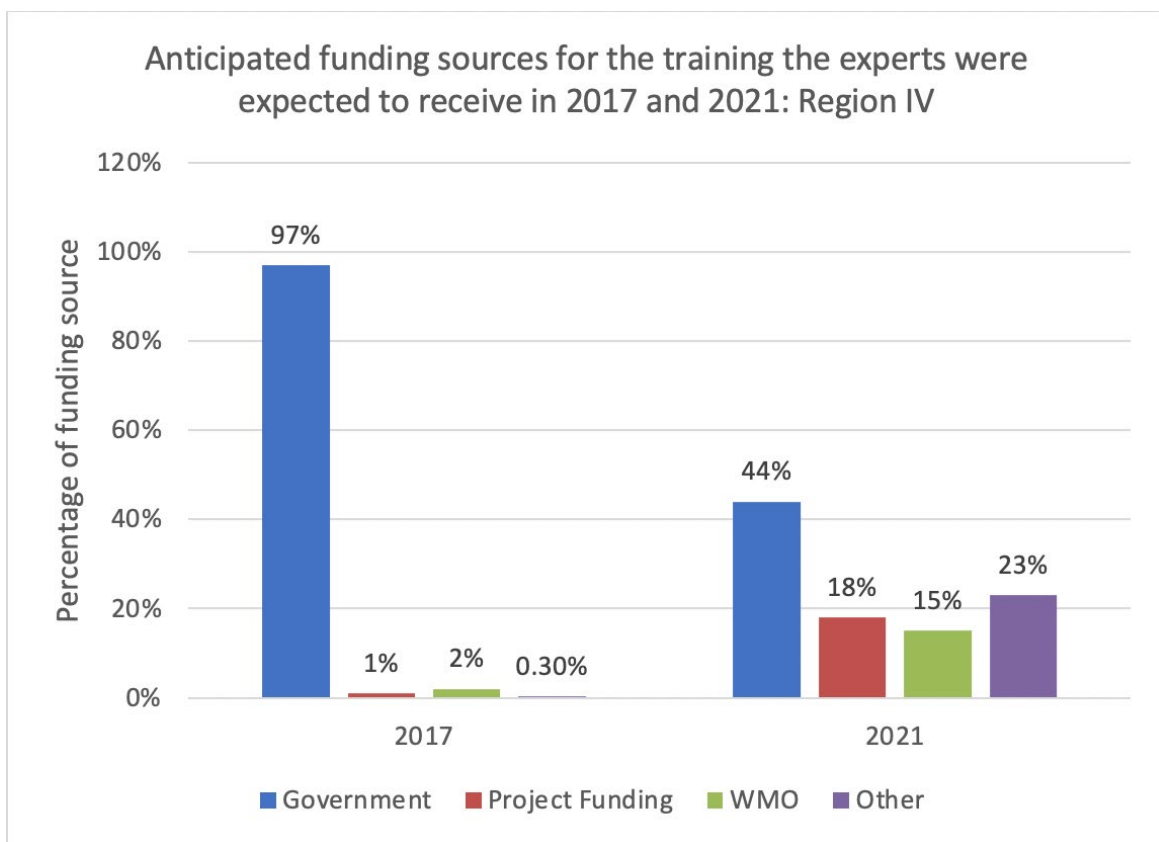
The number of experts expected to receive training through the support of government funding decreased from 458 in 2017 to 322 in 2021, and the number of experts expected to receive training through the support of WMO decreased from 135 in 2017 to 89 in 2021.

At the same time, the number of experts expected to receive training through the support of other funding sources more than tripled between the two years, from 59 in 2017 to 197 in 2021.

The number of experts expected to receive training through the support of project support was roughly the same in both years – 194 in 2017 and 180 in 2021.

**Region IV**

Figure 43 shows the anticipated funding sources for the training the experts in Region IV were expected to receive in 2017 and 2021 according to the 2021 and 2017 survey respondents.



**Figure 43. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region IV**

The survey respondents expected that 1 405 Region IV experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 4 734 Region IV experts would receive training in 2017. (See Tables 40 and 42.) This change reflects the much smaller numbers reported by the Region IV respondents in 2021, compared to those reported by the Region IV respondents in 2017.

In addition, of the 1 405 Region IV experts for whom training was expected in 2021, the survey respondents were only able to confirm the anticipated funding source for 293, or 21%. (See Table 40.)

Specifically, the 2021 survey respondents were able to confirm that, of the Region IV experts expected to receive training in 2021, it was anticipated that 129 (44%) would receive training

supported by government funding, 53 (18%) would receive training supported by project funding, 44 (15%) would receive training supported by WMO funding, and 67 (23%) would receive training supported by other funding sources.

In comparison, according to the 2017 survey respondents, of the Region IV experts expected to receive training in 2017, it was anticipated that 4 603 (97%) would receive training supported by government funding, 28 (1%) would receive training supported by project funding, 87 (2%) would receive training supported by WMO funding, and 16 (0.30%) would receive training supported by other funding sources.

The most significant difference between the two years related to anticipated funding from government sources. While in 2017, of the experts expected to receive training, it was anticipated that 4 603 would be supported by government funding, in 2021, it was anticipated that only 129 would be supported by this source. In fact, even if the unconfirmed anticipated funding source for the 1 100 experts expected to be trained in 2021 were attributed to government funding, the total number of experts expected to receive training supported by this source would still be much lower than the comparable number in 2017.

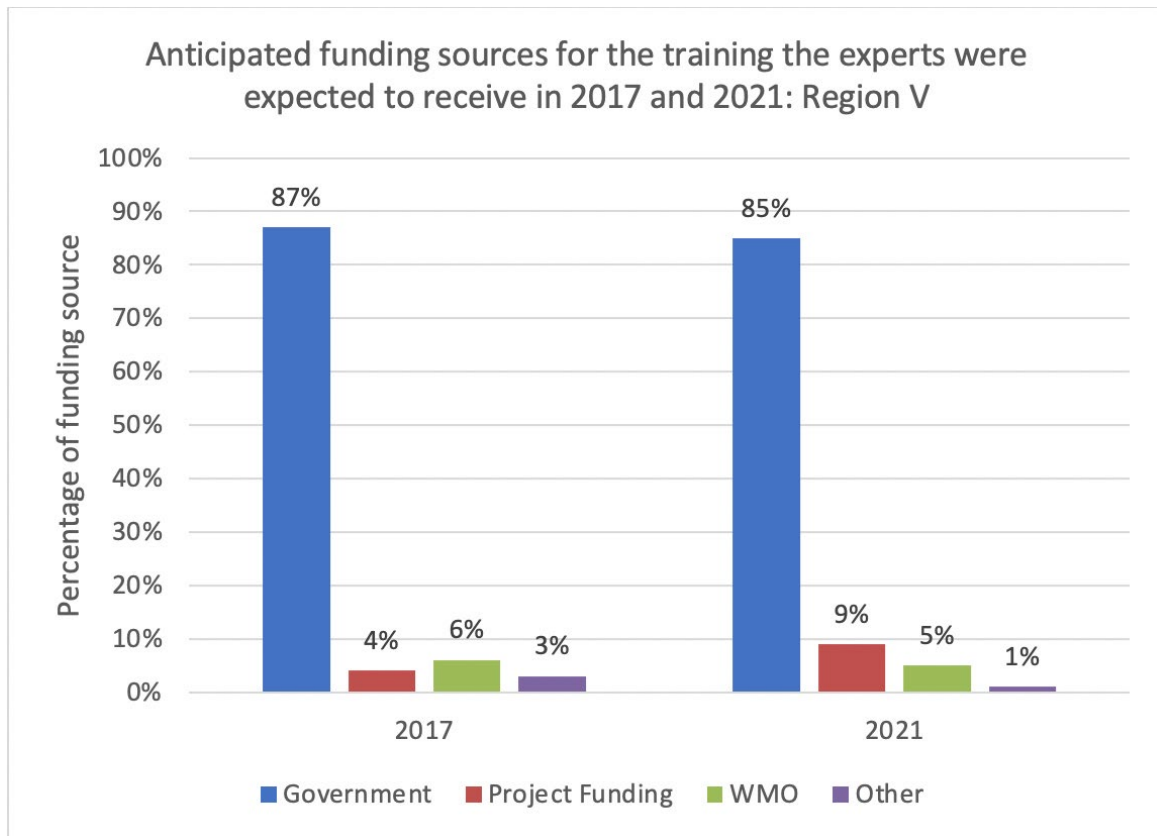
In addition, the number of experts expected to receive training through the support of WMO decreased by almost half between the two years, from 87 in 2017 to 44 in 2021.

At the same time, even though the anticipated funding source for the training most of the Region IV experts were expected to receive in 2021 was unconfirmed, the number of experts whose training was expected to be supported by project support almost doubled, from 28 in 2017 to 53 in 2021.

Furthermore, the number of experts expected to receive training through the support of other funding sources increased substantially between the two years, from 16 in 2017 to 67 in 2021.

### **Region V**

Figure 44 shows the anticipated funding sources for the training the experts in Region V were expected to receive in 2017 and 2021, according to the 2021 and 2017 survey respondents.



**Figure 44. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region V**

Region V is one of the regions in which more experts were expected to receive training in 2021 than in 2017. The 2021 survey respondents expected that 1 245 Region V experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 1 035 Region V experts would receive training in 2017. This represents an increase of 20% between the 2017 and 2021 figures. (See Tables 40 and 42.)

Region V's 2021 confirmed results were especially thorough. Of the 1 245 Region V experts expected to receive training in 2021, the survey respondents were able to confirm the anticipated funding source for 1 241, or 99.7%. (See Table 40.)

Specifically, in 2021, the survey respondents were able to confirm that, of the Region V experts expected to receive training, it was anticipated that 1 054 would receive training supported by government funding, 110 (9%) would receive training supported by project funding, 65 (5%) would receive training supported by WMO funding, and 12 (1%) would receive training supported by other funding sources.

In comparison, according to the 2017 survey respondents, of the Region V experts expected to receive training in 2017, it was anticipated that 898 (87%) would receive training supported by government funding, 45 (4%) would receive training supported by project funding, 62 (6%) would receive training supported by WMO funding, and 30 (3%) would receive training supported by other funding sources.

It is notable that the number of experts expected to receive training through the support of government funding increased from 898 in 2017 to 1 054 in 2021; this is an increase of 17%.

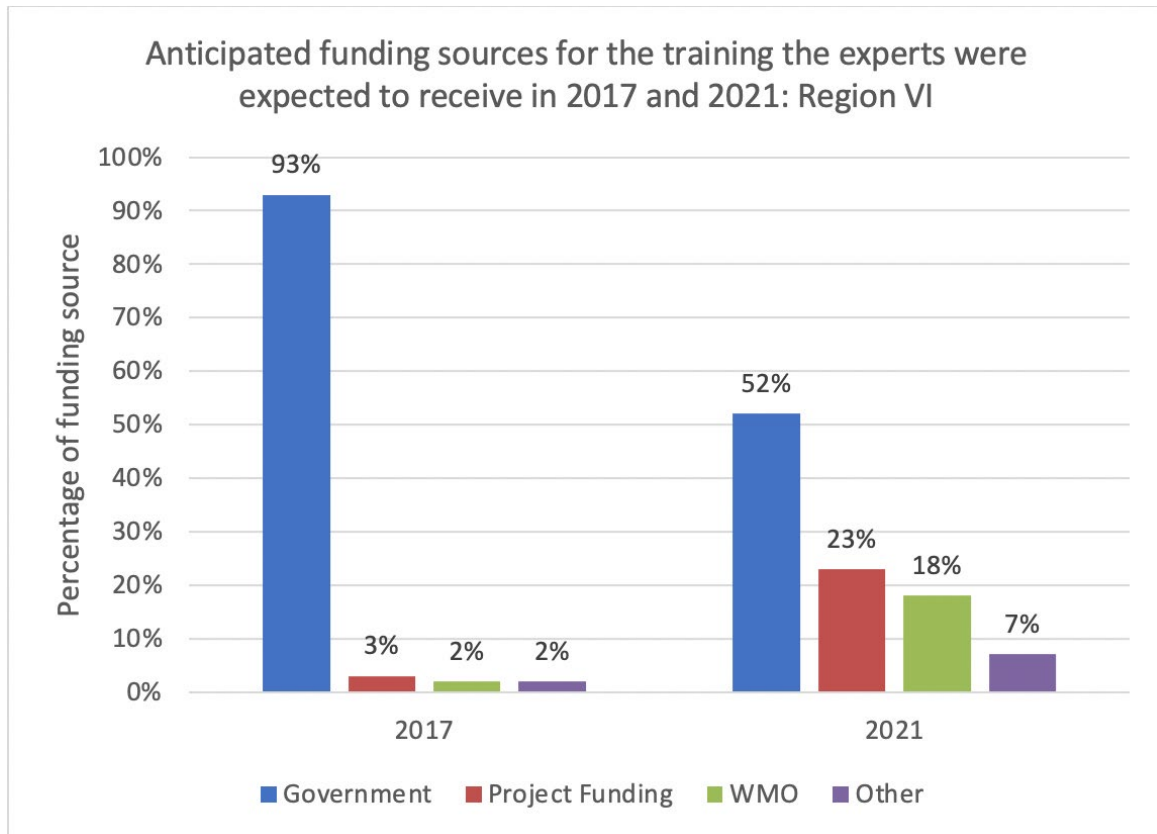
In addition, the number of experts expected to receive training through the support of anticipated project funding more than doubled between the two years – from 45 in 2017 to 110 in 2021.

The number of experts expected to receive training through the support of WMO funding was roughly the same in both years – 65 in 2021 and 62 in 2017.

Finally, the number of experts expected to receive training through the support of other funding sources decreased by more than half between the two years, from 30 in 2017 to 12 in 2021.

### Region VI

Figure 45 shows the anticipated funding sources for the training the experts in Region VI were expected to receive in 2017 and 2021, according to the 2021 and 2017 survey respondents.



**Figure 45. Anticipated funding sources for the training the experts were expected to receive in 2017 and 2021: Region VI**

The 2021 survey respondents expected that 1 116 Region VI experts would receive training in 2021; in comparison, the 2017 survey respondents expected that 4 429 Region VI experts would receive training in 2017. (See Tables 40 and 42.) This change is a result of some Region VI Members reporting information in 2017 but not in 2021, and from some Members reporting smaller numbers in 2021 than they did in 2017.

The Region VI respondents were unable to confirm an anticipated funding source for the training expected for many of their experts in 2021. Of the 1 116 experts who were expected to receive training in 2021, the respondents were only able to confirm the anticipated funding for 561, or 50%. (See Table 39.)

Specifically, the 2021 survey respondents were able to confirm that, of the Region VI experts expected to be training in 2021, it was anticipated that 290 (52%) would receive training supported by government funding, 130 (23%) would receive training supported by project funding, 100 (18%) would receive training supported by WMO funding, and 41 (7%) would receive training supported by other funding sources.



According to the 2017 survey respondents, of the Region VI experts expected to receive training in 2017, it was anticipated that 4 100 (93%) would receive training supported by government funding, 147 (3%) would receive training supported by project funding, 96 (2%) would receive training supported by WMO funding, and 86 (2%) would receive training supported by other funding sources.

Since an anticipated funding source could not be confirmed for half of Region VI's experts in 2021, a comparison with the anticipated funding sources for the training expected for the experts in 2017 is only moderately meaningful.

Nonetheless, it is notable that the number of experts expected to receive training through the support of government funding decreased from 4 100 in 2017 to 290 in 2021. In fact, even if the unconfirmed anticipated funding source for the 555 experts expected to be trained in 2021 were attributed to government funding, the total number of experts expected to receive training supported by this source would still be much lower than the comparable number in 2017. Of the experts who were expected to receive training in 2021 through the support of a confirmed anticipated funding source, 52% were expected to be supported by government funding; the comparable percentage in 2017 was 93%.

It is also notable that the number of Region VI Members that participated in the 2021 survey (27) was smaller than the number that participated in the 2017 survey (39). As a result, it is logical that the respondents to the 2021 survey would expect fewer experts to receive support for their training from government sources than did the larger number of respondents to the 2017 survey.

The number of Region VI experts expected to receive training through the support of WMO funding was about the same in 2021 (100) as it was in 2017 (96). However, of the experts who were expected to receive training in 2021 through the support of a confirmed anticipated funding source, the percentage expected to be supported by WMO funding in 2021 was 18%, while the comparable percentage in 2017 was 2%.

### 2.2.3 ***Level of priority for WMO support for fellowships***

#### **Major findings**

- Globally, WMO support for fellowships for short courses was considered to be a high priority by 65% of the survey respondents.
  - Globally, WMO support for fellowships for short courses was considered to be a medium priority by 17% of the respondents. Thus, the vast majority of the respondents (82%) considered WMO support for fellowships for short courses to be a high or a medium priority.
  - In all the regions except for Region IV, the respondents rated WMO support for short-course fellowships as a high priority more than WMO support for any other fellowship type. In Region IV, the respondents rated Bachelor of Science (BSc) programmes as a high priority more than WMO support for any other fellowship type.
- About one third of all respondents considered WMO support for fellowships for BSc programmes and Master of Science (MSc) programmes to be a high priority. About one quarter of all respondents considered WMO support for fellowships for PhD programmes to be a high priority.
  - More than 60% of all respondents considered WMO support for fellowships for BSc programmes and MSc programmes to be a medium or a high priority. Half of the respondents considered WMO support for fellowships for PhD programmes to be a high or a medium priority.
- WMO support for the various fellowship types was given different levels of priority by the various regions.



**Table 46. Percentage of respondents that indicated the level of priority for WMO support for BSc programme fellowships**

Priority level	Region						Global
	I	II	III	IV	V	VI	
High	41%	20%	44%	61%	36%	4%	34%
Medium	33%	36%	33%	22%	36%	11%	28%
Low	22%	28%	22%	6%	29%	56%	27%
Priority level not indicated	4%	16%	0%	11%	0%	30%	10%
Total percentage	100%	100%	100%	100%	100%	100%	100%

**Table 47. Percentage of respondents that indicated the level of priority for WMO support for MSc programme fellowships**

Priority level	Region						Global
	I	II	III	IV	V	VI	
High	48%	44%	33%	39%	50%	7%	37%
Medium	39%	20%	33%	44%	14%	11%	27%
Low	11%	24%	22%	11%	29%	52%	25%
Priority level not indicated	2%	12%	11%	6%	7%	30%	11%
Total percentage	100%	100%	100%	100%	100%	100%	100%

**Table 48. Percentage of respondents that indicated the level of priority for WMO support for PhD programme fellowships**

Priority level	Region						Global
	I	II	III	IV	V	VI	
High	37%	28%	22%	17%	29%	7%	23%
Medium	33%	24%	44%	28%	14%	11%	26%
Low	28%	36%	22%	44%	43%	52%	38%
Priority level not indicated	2%	12%	11%	11%	14%	30%	13%
Total percentage	100%	100%	100%	100%	100%	100%	100%

Figures 46 and 47 depict the same information that is presented in Tables 45 through 48: the global and regional levels of priority for the four types of WMO fellowship support.

In Figure 46, the chart with blue bars shows the respondents' priority levels concerning WMO support for short-course fellowships, and the chart with orange bars shows the respondents' priority levels concerning WMO support for BSc programme fellowships.

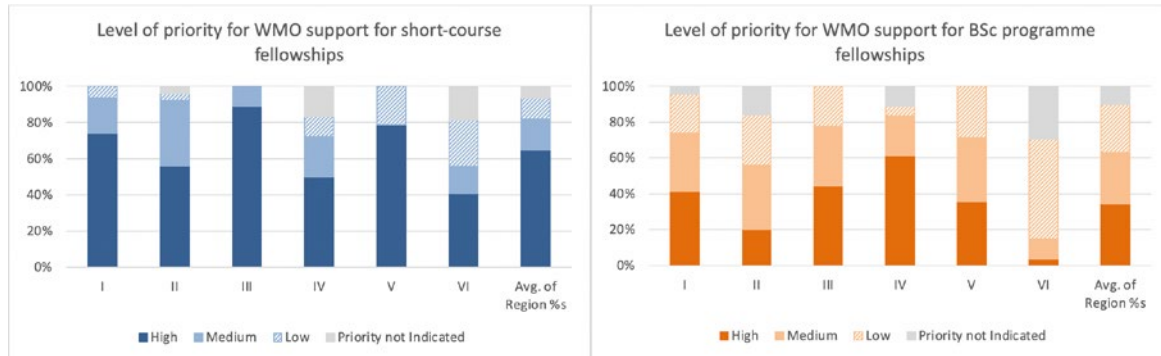
In Figure 47, the chart with red bars shows the respondents' priority levels concerning WMO support for MSc programme fellowships, and the chart with purple bars shows the respondents' priority levels concerning WMO support for PhD programme fellowships.

In all four charts, the dark-coloured segments in each bar represent the percentage of respondents that rated that type of fellowship as a high priority.

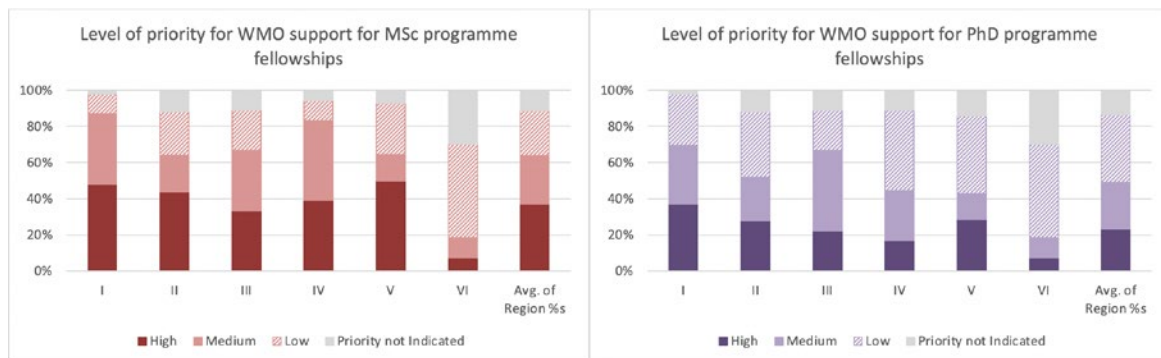
The light-coloured segments in each bar represent the percentage of respondents that rated that type of fellowship as a medium priority.

The narrow-striped segments in each bar represent the percentage of respondents that rated that type of fellowship as a low priority.

The pale grey segments in each bar represent the percentage of respondents that did not indicate a priority level for that type of fellowship.



**Figure 46. Levels of priority for WMO support for short-course and BSc programme fellowships**



**Figure 47. Levels of priority for WMO support for MSc and PhD programme fellowships**

## Global

### Short courses

WMO support for fellowships for short courses was a high priority for 65% and a medium priority for 17% of the survey respondents. Thus, the vast majority of the respondents (82%) considered WMO support for fellowships for short courses to be a high or a medium priority.

WMO support for fellowships for short courses was a low priority for 11% of the respondents.

Seven per cent of the respondents did not indicate a priority level for WMO support for fellowships for short courses.

### BSc and MSc programmes

The survey respondents indicated similar levels of priority for WMO support for fellowships for BSc and MSc programmes.

WMO support for fellowships for BSc programmes was a high priority for 34% and a medium priority for 28% of the respondents; WMO support for fellowships for MSc programmes was a high priority for 37% and a medium priority for 27% of the respondents. Thus, about two thirds of the respondents classified WMO support for both BSc and MSc programmes as either a high or a medium priority (63% for WMO support for BSc programmes and 64% for WMO support for MSc programmes).

WMO support for fellowships for BSc programmes was a low priority for 27% of the respondents, and WMO support for fellowships for MSc programmes was a low priority for 25% of the respondents.

Ten per cent of the respondents did not indicate a priority level for WMO support for fellowships for BSc programmes, and 11% of the respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

#### *PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 23% and a medium priority for 26% of the survey respondents. Thus, about half of the respondents (49%) classified WMO support for fellowships for PhD programmes as a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 38% of the respondents.

Thirteen per cent of the respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

### **Region I**

WMO support for fellowships for short courses was a high priority for three quarters of Region I respondents, and WMO support for fellowships for MSc programmes was a high priority for almost half of Region I respondents. WMO support for fellowships for BSc programmes and PhD programmes was a high priority for about 40% of Region I respondents.

#### *Short courses*

WMO support for fellowships for short courses was a high priority for 74% and a medium priority for 20% of Region I respondents. Thus, the vast majority of Region I respondents (93%) considered WMO support for fellowships for short courses to be a high or a medium priority.

WMO support for fellowships for short courses was a low priority for 7% of Region I respondents.

All of the Region I respondents indicated a priority level for WMO support for fellowships for short courses.

#### *BSc programmes*

WMO support for fellowships for BSc programmes was a high priority for 41% and a medium priority for 33% of Region I respondents. Thus, about three quarters (74%) of Region I respondents considered WMO support for fellowships for BSc programmes to be a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 22% of Region I respondents.

Four per cent of Region I respondents did not indicate a priority level for WMO support for fellowships for BSc programmes.

*MSc programmes*

For Region I respondents, WMO support for MSc programmes was a slightly higher priority than WMO support for BSc programmes.

WMO support for fellowships for MSc programmes was a high priority for 48% and a medium priority for 39% of Region I respondents. Thus, over three quarters (87%) of Region I respondents considered WMO support for fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 11% of Region I respondents.

Two per cent of Region I respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

*PhD programmes*

Fellowships for PhD programmes were high priority for 37% and medium priority for 33% of Region I respondents. Thus, 70% of Region I respondents considered fellowships for PhD programmes to be high or medium priority.

WMO support for fellowships for PhD programmes was a low priority for 28% of Region I respondents.

Two per cent of Region I respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

**Region II**

WMO support for fellowships for short courses was a high priority for more than half (56%), and WMO support for fellowships for MSc programmes was a high priority for almost half (44%) of Region II respondents. WMO support for fellowships for PhD programmes was a high priority for 28% of Region II respondents and WMO support for fellowships for BSc programmes was a high priority for 20% of Region II respondents.

*Short courses*

WMO support for fellowships for short courses was a high priority for 56% and a medium priority for 36% of Region II respondents. Thus, the vast majority of Region II respondents (92%) considered WMO support for fellowships for short courses to be a high or a medium priority.

WMO support for fellowships for short courses was a low priority for 4% of Region II respondents.

Two per cent of Region II respondents did not indicate a priority level for WMO support for short-course fellowships.

*BSc programmes*

WMO support for fellowships for BSc programmes was a high priority for 20% and a medium priority for 36% of Region II respondents. Thus, about half (56%) of Region II respondents considered WMO support for fellowships for BSc programmes to be a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 28% of Region II respondents.

Sixteen per cent of Region II respondents did not indicate a priority level for WMO support for fellowships for BSc programmes.

*MSc programmes*

For Region II respondents, WMO support for fellowships for MSc programmes was a higher priority than WMO support for fellowships for BSc programmes.

WMO support for fellowships for MSc programmes was a high priority for 44% and a medium priority for 20% of Region II respondents. Thus, about two thirds (64%) of Region II respondents considered WMO support for fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 24% of Region II respondents.

Twelve per cent of the Region II respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

*PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 28% and a medium priority for 24% of Region II respondents. Thus, half of Region II respondents (52%) considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 36% of Region II respondents.

Twelve per cent of Region II respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

**Region III**

WMO support for fellowships for short courses was a high priority for nearly all (89%) of Region III respondents. WMO support for fellowships for BSc programmes was a high priority for almost half (44%) of Region III respondents. WMO support for fellowships for MSc programmes was a high priority for 33% and WMO support for fellowships for PhD programmes was a high priority for 22% of Region III respondents.

*Short courses*

WMO support for fellowships for short courses was a high priority for 89% and a medium priority for 11% of Region III respondents. Thus, all of the Region III respondents (100%) considered WMO support for fellowships for short courses to be a high or a medium priority.

*BSc programmes*

WMO support for fellowships for BSc programmes was a high priority for 44% and a medium priority for 33% of Region III respondents. Thus, about three quarters (78%) of Region III respondents considered WMO support for fellowships for BSc programmes to be a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 22% of Region III respondents. All of the Region III respondents indicated a priority level for WMO support for BSc programmes.

*MSc programmes*

WMO support for fellowships for MSc programmes was a high priority for 33% and a medium priority for 33% of Region III respondents. Thus, about two thirds (67%) of Region III respondents considered WMO support for fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 22% of Region III respondents.

Eleven per cent of Region III respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

#### *PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 22% and a medium priority for 44% of Region III respondents. Thus, about two thirds of Region III respondents (67%) considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 22% of Region III respondents.

Eleven per cent of Region III respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

### **Region IV**

WMO support for fellowships for BSc programmes was a uniquely high priority in Region IV; in this region, 61% of respondents rated WMO support for these fellowships as a high priority. WMO support for fellowships for short courses was a high priority for half (50%) of Region IV respondents. WMO support for fellowships for MSc programmes was a high priority for 39% of Region IV respondents, and WMO support for fellowships for PhD programmes was a high priority for 17% of Region IV respondents.

#### *Short courses*

WMO support for fellowships for short courses was a high priority for 50% and medium priority for 22% of Region IV respondents. Thus, about three fourths of Region IV respondents (72%) considered WMO support for fellowships for short courses to be a high or a medium priority.

WMO support for fellowships for short courses was a low priority for 11% of Region IV respondents.

Seventeen per cent of Region IV respondents did not indicate a priority level for WMO support for fellowships for short courses.

#### *BSc programmes*

For Region IV respondents, WMO support for fellowships for BSc programmes were the highest priority among the fellowship types.

WMO support for fellowships for BSc programmes was a high priority for 61% and a medium priority for 22% of Region IV respondents. Thus, most (83%) of the Region IV respondents considered WMO support for fellowships for BSc programmes a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 6% of Region IV respondents.

Eleven per cent of Region IV respondents did not indicate a priority level for WMO support for fellowships for BSc programmes.

#### *MSc programmes*

WMO support for fellowships for MSc programmes was a high priority for 39% and medium priority for 44% of Region IV respondents. Thus, most (83%) of the Region IV respondents considered WMO support for fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 11% of Region IV respondents.



Six per cent of Region IV respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

#### *PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 17% and medium priority for 28% of Region IV respondents. Thus, almost half of Region IV respondents (44%) considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 44% of Region IV respondents.

Eleven per cent of Region IV respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

### **Region V**

WMO support for fellowships for short courses was a high priority for 79% of Region V respondents, and WMO support for fellowships for MSc programmes was a high priority for half (50%) of Region V respondents. WMO support for fellowships for BSc programmes was a high priority for 36% of Region V respondents, and WMO support for fellowships for PhD programmes was a high priority for 29% of Region V respondents.

#### *Short courses*

WMO support for fellowships for short courses was a high priority for 79% and a medium priority for 0% of Region V respondents.

WMO support for fellowships for short courses was a low priority for 21% of survey respondents.

All of the Region V respondents indicated a priority level for WMO support for fellowships for short courses.

#### *BSc programmes*

WMO support for fellowships for BSc programmes was a high priority for 36% and a medium priority for 36% of Region V respondents. Thus, about three quarters (71%) of Region V respondents considered fellowships for BSc programmes to be a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 29% of Region V respondents.

All of the Region V respondents indicated a priority level for WMO support for fellowships for BSc programmes.

#### *MSc programmes*

For Region V respondents, WMO support for fellowships for MSc programmes was a higher priority than WMO support for fellowships for BSc programmes.

WMO support for fellowships for MSc programmes was a high priority for 50% and a medium priority for 14% of Region V respondents. Thus, about two thirds (64%) of Region V respondents considered WMO support for fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 29% of Region V respondents.

Seven per cent of Region V respondents did not indicate a priority level for WMO support for MSc programmes.

*PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 29% and a medium priority for 14% of Region V respondents. Thus, half of Region V respondents (43%) considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 43% of Region V respondents.

Fourteen per cent of Region V respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

**Region VI**

WMO support for fellowships for short courses was a high priority for 41% of Region VI respondents. WMO support for fellowships for BSc programmes, MSc programmes, and PhD programmes was a high priority for only 4% to 7% of Region VI respondents.

*Short courses*

WMO support for fellowships for short courses was a high priority for 41% and a medium priority for 15% of Region VI respondents. Thus, half of respondents Region VI (56%) considered WMO support for fellowships for short courses to be a high or a medium priority.

WMO support for fellowships for short courses was a low priority for 26% of Region VI respondents.

Nineteen per cent of Region VI respondents did not indicate a priority level for WMO support for fellowships for short courses.

*BSc programmes*

WMO support for fellowships for BSc programmes was a high priority for 4% and medium priority for 11% of Region VI respondents. Thus, 15% of Region VI respondents considered WMO support for fellowships for BSc programmes to be a high or a medium priority.

WMO support for fellowships for BSc programmes was a low priority for 56% of Region VI respondents.

Thirty per cent of Region VI respondents did not indicate a priority level for WMO support for fellowships for BSc programmes.

*MSc programmes*

WMO support for fellowships for MSc programmes was a high priority for 7% and a medium priority for 11% of Region VI respondents. Thus, 19% of Region VI respondents considered fellowships for MSc programmes to be a high or a medium priority.

WMO support for fellowships for MSc programmes was a low priority for 52% of Region VI respondents.

Thirty per cent of Region VI respondents did not indicate a priority level for WMO support for fellowships for MSc programmes.

*PhD programmes*

WMO support for fellowships for PhD programmes was a high priority for 7% and a medium priority for 11% of Region VI respondents. Thus, 19% of Region VI respondents considered WMO support for fellowships for PhD programmes to be a high or a medium priority.

WMO support for fellowships for PhD programmes was a low priority for 52% of Region VI respondents.

Thirty per cent of Region VI respondents did not indicate a priority level for WMO support for fellowships for PhD programmes.

#### 2.2.4 ***Areas in which NMHS staff training was needed***

##### **Major findings**

- The top two training priorities for all respondents to the 2021 survey were Weather Forecasting and Climate Services.
  - Weather Forecasting and Climate Services were also the top two training priorities for the respondents in each of the regions, with the exception of Region V, where the respondents' top two training priorities were Weather Forecasting, and Marine Meteorology and Oceanography.
- The top two training priorities for all respondents to the 2017 survey were Weather Forecasting and Numerical Weather Prediction (NWP), and Instrumentation/Observation.
  - Weather Forecasting and NWP, and Instrumentation/Observation were also the top two training priorities for the respondents to the 2017 survey in each of the regions, with the exception of Region III, where the respondents' top two training priorities were Weather Forecasting and NWP, and Climate Services.
- The priority training topics were consistent in the 2017 and 2021 surveys.
  - The areas requiring the most training, according to the respondents to both surveys, included Weather Forecasting, Climate Services, and Atmospheric Modelling and NWP, Instrumentation/Observation and Hydrology/Hydrometeorology.
  - Also important were Agrometeorology; Aeronautical Meteorology; Management and Administration Skills, and IT, Computing, and Data Processing.
  - Marine Meteorology and Oceanography also figured among the most important training topics according to the 2021 survey respondents.
- The regions indicated several different training priorities in the 2021 survey.
  - For example, training in General Meteorology was a high priority for Region III, although this topic did not appear in the other regions' top priority lists.
  - Similarly, Customer Interactions and Communications was among Region VI's training priorities, although it did not appear in the other regions' top priority lists.
  - "Instructional techniques for online and face-to-face training" appeared among the top training priorities for both Region I and Region III. This topic received one or more priority votes in every region.

##### **Detailed results**

Table 49 shows the number of responses regarding areas in which NMHS staff training was needed, according to the 2021 survey respondents.

**Table 49. Number of responses regarding areas in which NMHS staff training was needed, according to the 2021 survey respondents**

Priority area	Region						Global
	I	II	III	IV	V	VI	
Priority 1	45	23	9	18	13	20	128
Priority 2	45	22	9	18	13	20	127
Priority 3	45	22	9	18	13	20	127
Priority 4	45	22	8	18	13	20	126
Total no. of survey respondents	46	25	9	18	14	27	139

Table 49 shows that most survey respondents in each region shared information on the areas in which their staff most needed training. Several of the Region II respondents, as well as seven of the Region VI respondents, did not share information on priority training areas for their staff.

A question about priority training topics was first included in the 2017 survey. For that question, the respondents wrote in four areas in which their staff most needed training. These submitted topics were standardized into a list of eighteen topics as part of the analysis of the 2017 survey results.

The 2021 survey included a list of eighteen topics based on the list from the 2017 survey and invited respondents to indicate, in order of priority, the four areas in which their staff most needed training.

The eighteen topics were:

1. Aeronautical Meteorology
2. Agrometeorology
3. Atmospheric Modelling and NWP
4. Atmospheric Sciences and Research
5. Basic Instructional Package (BIP) for Meteorological Technicians (MT)
6. Basic Instructional Package (BIP) for Meteorologists (M)
7. Climate Services
8. Communications and Customer Interaction
9. General Meteorology
10. Hydrology and Hydrometeorology
11. Instructional techniques for online and face-to-face training
12. Instrumentation and Observation
13. IT skills, Computing, Data Processing
14. Management and Administration Skills
15. Marine Meteorology and Oceanography
16. Project Management
17. Public Education and Outreach
18. Weather Forecasting

The present report refers to a respondent's selection of a topic as one of their top four training priorities as a "vote".

Not all survey respondents indicated a full set of four training priorities: 128 respondents indicated a first training priority; 127 respondents indicated a second and a third training priority; and 126 indicated a fourth priority. The respondents cast a total of 508 votes for their training priorities.

Table 50 shows the number of votes each training topic received as a respondent's first, second, third, or fourth training priority. The far right column of the table shows the total votes each topic received across all four priority ratings. The table is sorted by the total number of votes.

**Table 50. Training topics and number of respondents that selected each topic as a priority**

	<i>Training topic</i>	<i>1st priority</i>	<i>2nd priority</i>	<i>3rd priority</i>	<i>4th priority</i>	<i>Total</i>
1	Climate Services	7	19	39	14	79
2	Weather Forecasting	46	16	9	5	76
3	Atmospheric Modelling and NWP	13	9	9	12	43
4	Instrumentation and Observation	8	24		11	43
5	Hydrology and Hydrometeorology	7	11	10	7	35
6	Aeronautical Meteorology	5	8	10	9	32
7	IT, Computing, Data Processing	4	7	6	14	31
8	Agrometeorology	3	11	5	7	26
9	Marine Met and Oceanography	7	2	4	11	24
10	Management and Admin Skills	4	2	4	13	23
11	BIP-M	11	6	1		18
12	Instructional techniques		1	16	1	18
13	BIP-MT	3	5	2	4	14
14	Atmospheric Sciences & Research	2	1	3	6	12
15	General Meteorology	7	1	1	2	11
16	Customer Interaction/Comms		2	4	4	10
17	Project Management	1	1	2	5	9
18	Public Education and Outreach		1	2	1	4
	Total votes	128	127	127	126	508

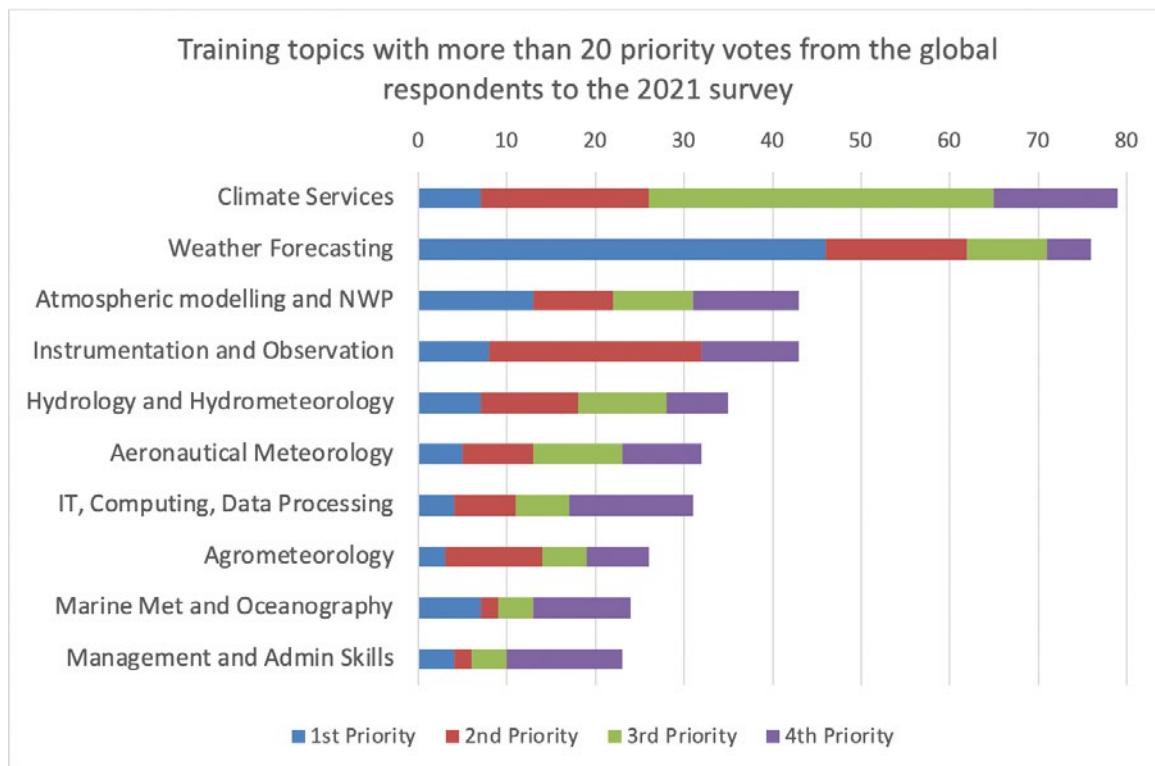
Note: The shaded cells indicate topics which few respondents selected as a priority. Dark grey = zero respondents; medium grey = one respondent; pale grey = two respondents.

Table 50 shows that the total number of votes each training topic received ranged from a high of 79 to a low of 4. Ten topics were selected by more than twenty respondents as a top-four training priority.

Figure 48 shows those ten training topics and the number of votes each received as the first, second, third, or fourth training priority from the global respondents to the 2021 survey.

The blue segments represent the number of votes each topic received as the first priority, the red segments represent the number of votes each topic received as the second priority, the green segments represent number of votes each topic received as the third priority, and the purple segments represent number of votes each topic received as the fourth priority.

The training topics were sorted by the total number of priority votes each topic received.



**Figure 48. Training topics with more than 20 priority votes from the global respondents to the 2021 survey**

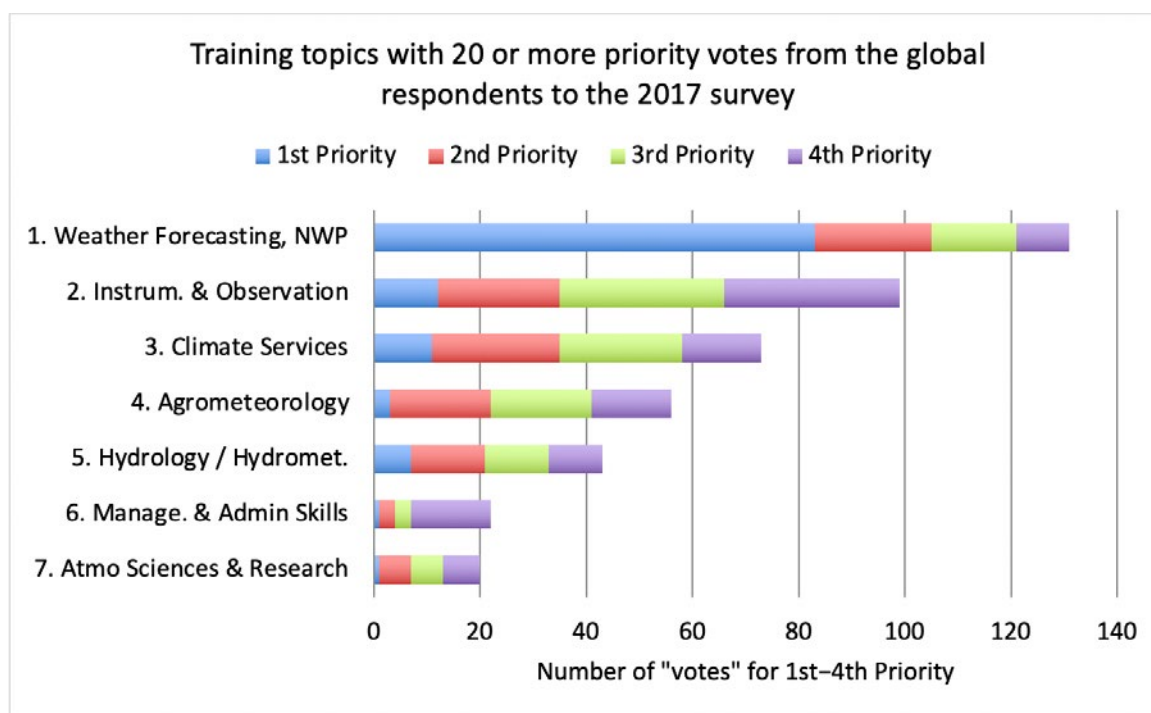
Table 50 and Figure 48 show that while Climate Services received the highest number of priority votes overall, Weather Forecasting was by far the training topic most frequently indicated as the top priority. Weather Forecasting received 76 votes overall, including 46 first-priority votes, 16 second-priority votes, 9 third-priority votes, and 5 fourth-priority votes. Climate Services received 79 votes overall, including 7 first-priority votes, 19 second-priority votes, 39 third-priority votes, and 14 fourth-priority votes.

Atmospheric Modelling and NWP, and Instrumentation and Observation were the next most frequently selected training priorities, each receiving 43 votes overall.

Hydrology and Hydrometeorology was the following most frequently selected training priority, with 35 votes overall, followed by Aeronautical Meteorology, with 32 votes.

The next most frequently selected training priorities were IT, Computing, and Data Processing (31 votes); Agrometeorology (26 votes); Marine Meteorology and Oceanography (24 votes); and Management and Administration Skills (23 votes).

Figure 49 shows the seven training topics that received 20 or more priority votes from the global respondents to the 2017 survey.



**Figure 49. Training topics with more than 20 priority votes from the global respondents to the 2017 survey**

Figures 48 and 49 show that globally, the training priorities remained much the same from 2017 to 2021. According to the respondents to both surveys, the highest priority training areas were Weather Forecasting, Climate Services, and Atmospheric Modelling and NWP, followed by Instrumentation and Observation, and Hydrology and Hydrometeorology.

Agrometeorology; Aeronautical Meteorology; Management and Administration Skills; and IT, Computing, and Data Processing were also important.

Marine Meteorology and Oceanography also figured among the most important training topics in 2021.

Table 51 shows the number of priority votes each training topic received from the respondents to the 2021 survey, globally and in each region, irrespective of whether the respondents considered the topics to be their first, second, third, or fourth priority. The table is sorted by the number of priority votes each topic received globally.

**Table 51. Number of priority votes each training topic received from the respondents to the 2021 survey, globally and in each region**

Training topic	Global	Region					
		I	II	III	IV	V	VI
Climate Services	79	30	14	6	14	4	11
Weather Forecasting	76	23	15	5	12	7	14
Atmospheric Modelling and NWP	43	15	13	2	2	4	7
Instrumentation and Observation	43	19	9	2	6	5	2
Hydrology and Hydrometeorology	35	11	5	2	5	4	8
Aeronautical Meteorology	32	11	5	3	5	3	5
IT, Computing, Data Processing	31	6	4	3	3	5	10
Agrometeorology	26	16	4	2			4
Marine Met and Oceanography	24	13	1	1	4	5	

Training topic	Global	Region					
		I	II	III	IV	V	VI
Management and Admin Skills	23	10	3		4	1	5
BIP-M	18	2	6		5	3	2
Instructional techniques	18	9	1	2	2	3	1
BIP-MT	14	2	5	1	1	4	1
Atmospheric Sciences & Research	12	4	3	1	2	1	1
General Meteorology	11	4	1	4	1		1
Customer Interaction/Comms	10	4			1	2	3
Project Management	9	1		1	3	1	3
Public Education and Outreach	4				2		2
Total votes	508	180	89	35	72	52	80

Note: The shaded cells indicate topics which few respondents selected as a priority. Dark grey = zero respondents; medium grey = one respondent; pale grey = two respondents.

Table 52 shows the percentage of priority votes each training topic received from the respondents to the 2021 survey, globally and in each region, irrespective of whether the respondents considered the topics to be their first, second, third or fourth priority. The table is sorted by the percentage of priority votes each topic received globally.

**Table 52. Percentage of priority votes each topic received from the respondents to the 2021 survey, globally and in each region**

Priority area	Global	Region					
		I	II	III	IV	V	VI
Climate Services	16%	17%	16%	17%	19%	8%	14%
Weather Forecasting	15%	13%	17%	14%	17%	13%	18%
Atmospheric Modelling and NWP	8%	8%	15%	6%	3%	8%	9%
Instrumentation and Observation	8%	11%	10%	6%	8%	10%	3%
Hydrology and Hydrometeorology	7%	6%	6%	6%	7%	8%	10%
Aeronautical Meteorology	6%	6%	6%	9%	7%	6%	6%
IT, Computing, Data Processing	6%	3%	4%	9%	4%	10%	13%
Agrometeorology	5%	9%	4%	6%			5%
Marine Met and Oceanography	5%	7%	1%	3%	6%	10%	
Management and Admin Skills	5%	6%	3%		6%	2%	6%
BIP-M	4%	1%	7%		7%	6%	3%
Instructional techniques	4%	5%	1%	6%	3%	6%	1%
BIP-MT	3%	1%	6%	3%	1%	8%	1%
Atmospheric Sciences & Research	2%	2%	3%	3%	3%	2%	1%
General Meteorology	2%	2%	1%	11%	1%		1%
Customer Interaction/Comms	2%	2%			1%	4%	4%
Project Management	2%	1%		3%	4%	2%	4%
Public Education and Outreach	1%				3%		3%
Total votes	100%	100%	100%	100%	100%	100%	100%

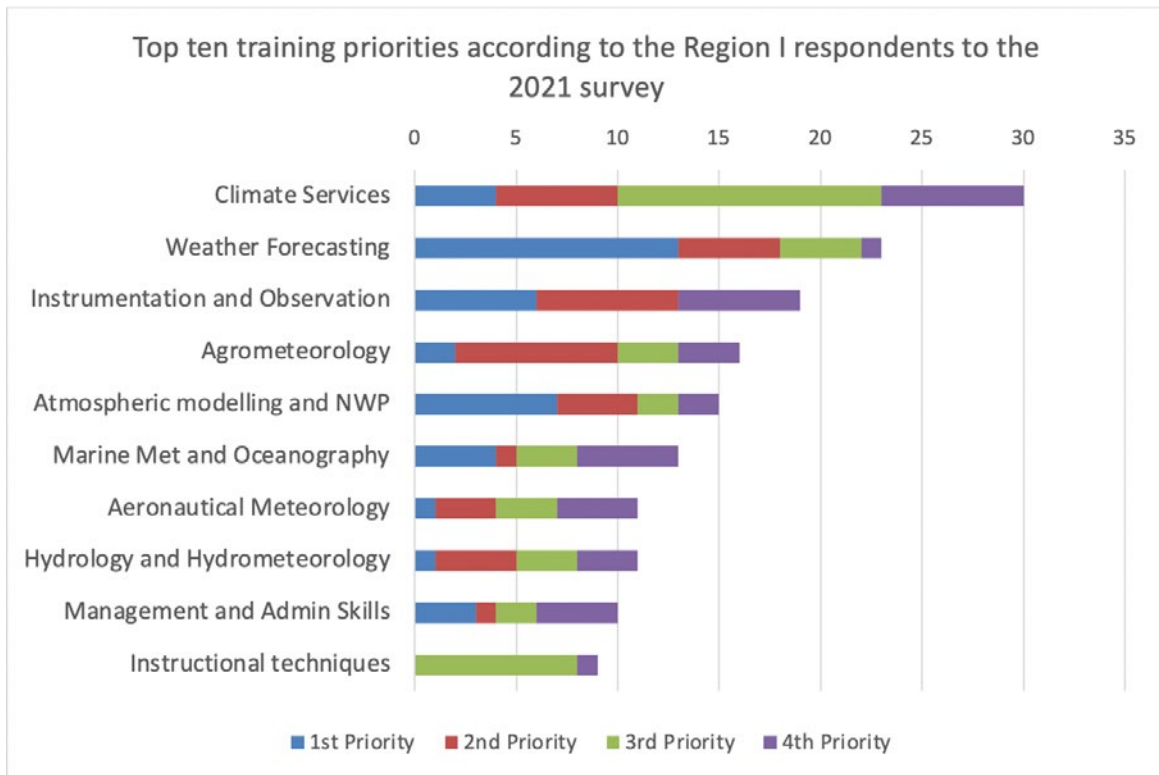
Note: The shaded cells indicate topics which few respondents selected as a priority. Dark grey = 0% of respondents; medium grey = 1%–2% of respondents; pale grey = 3%–4% of respondents.



Table 52 shows that the order of training priorities for each region is similar to the order globally, with some exceptions. In Region III, for example, 11% of respondents selected General Meteorology as one of their top training priorities, which would place this topic as Region III’s third training priority. In addition, in Region V, 10% of respondents selected IT, Computing, Data Processing, as well as Marine Meteorology and Oceanography, as their top training priorities, which would place these topics behind Climate Services and Weather Forecasting, and alongside Instrumentation and Observation, in the priority order in that region.

**Region I**

Figure 50 shows the ten training topics that received the highest number of priority votes from the Region I respondents to the 2021 survey.



**Figure 50. Top ten training priorities according to the Region I respondents to the 2021 survey**

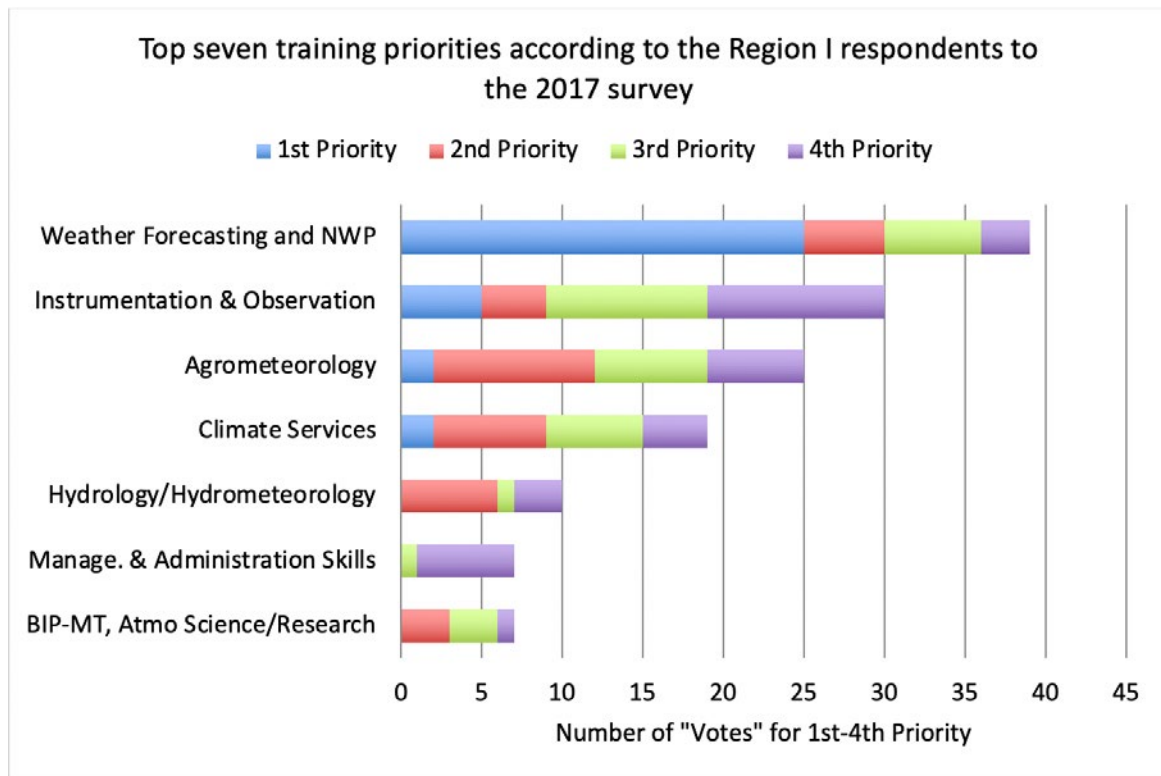
Figure 50 shows that for Region I, Climate Services received the highest number of priority votes overall (30 votes), followed by Weather Forecasting (23 votes). However, Weather Forecasting received the highest number of first-priority votes.

Instrumentation and Observation (19 votes) and Agrometeorology (16 votes) were the third and fourth most frequently selected training priorities.

Atmospheric Modelling and NWP (15 votes) and Marine Meteorology and Oceanography (13 votes) were the fifth and sixth most frequently selected training priorities.

Aeronautical Meteorology (11 votes), Hydrology and Hydrometeorology (11 votes), Management and Administration Skills (10 votes), and Instructional techniques for online and face-to-face training (9 votes) completed Region I’s top ten list.

Figure 51 shows the seven training topics that received the highest number of priority votes from the Region I respondents to the 2017 survey.



**Figure 51. Top seven training priorities according to the Region I respondents to the 2017 survey**

Figures 50 and 51 show that Region I's training priorities remained much the same from 2017 to 2021.

According to the respondents to both surveys, the highest priority training areas were Weather Forecasting, Climate Services, Instrumentation and Observation, Agrometeorology, and Atmospheric Modelling and NWP.

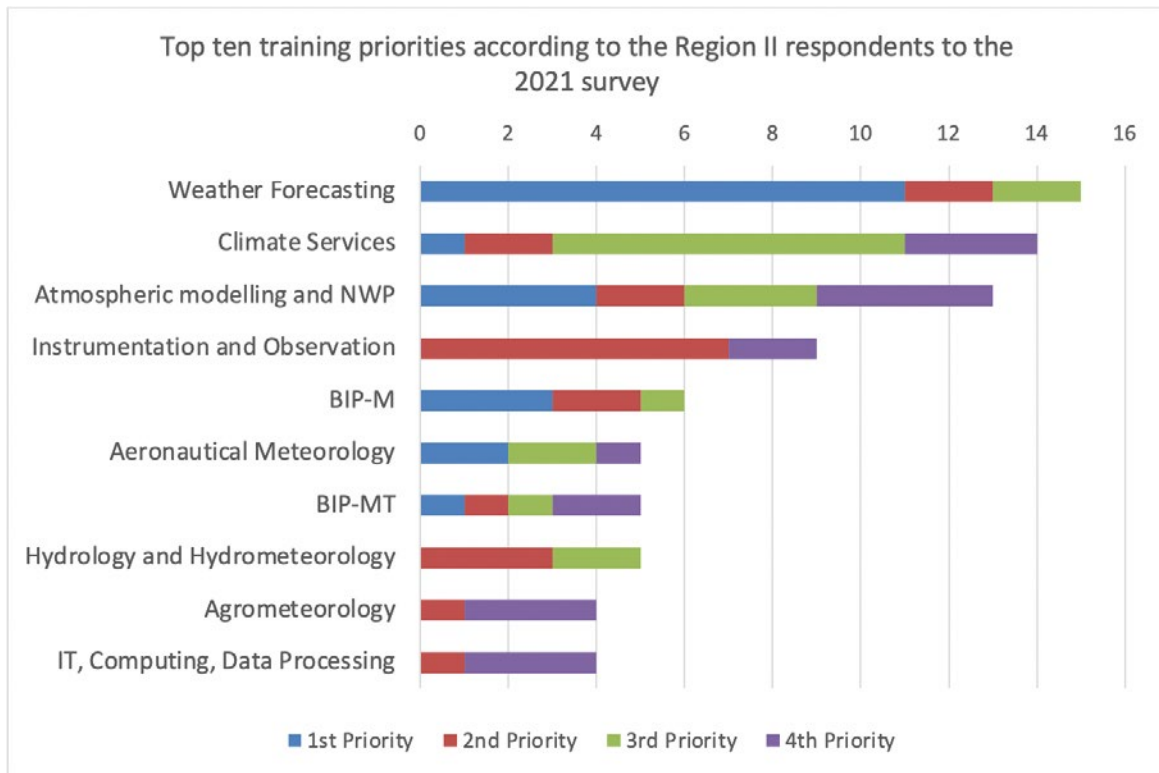
Hydrology and Hydrometeorology and Management and Administration Skills were also important.

Aeronautical Meteorology and Instructional Techniques were among the top priorities for the Region I respondents to the 2021 survey but not for the Region I respondents to the 2017 survey.

BIP-MT and Atmospheric Science and Research were among the top priorities for the Region I respondents to the 2017 survey but not for the Region I respondents to the 2021 survey.

## **Region II**

Figure 52 shows the ten training topics that received the highest number of priority votes from the Region II respondents to the 2021 survey.



**Figure 52. Top ten training priorities according to the Region II respondents to the 2021 survey**

Figure 52 shows that for Region II, Weather Forecasting received the highest number of priority votes overall (15 votes), as well as by far the most first-priority votes.

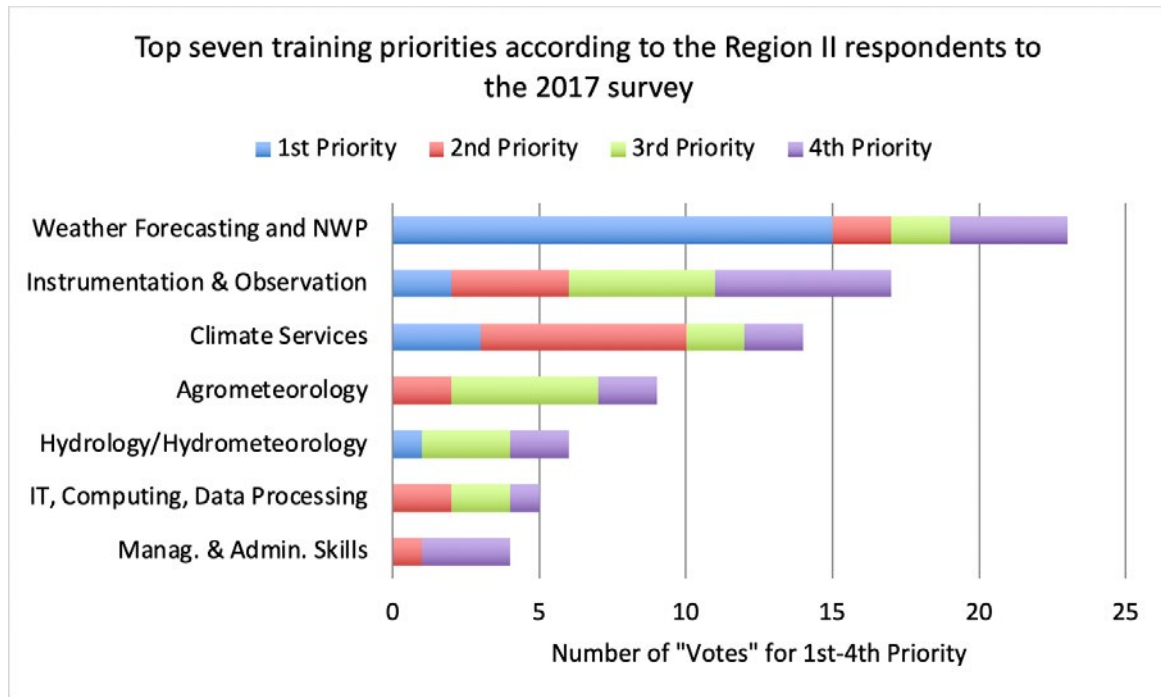
Climate Services received the second highest number of priority votes (14 votes), followed by Atmospheric Modelling and NWP (13 votes). Atmospheric Modelling and NWP received more first-priority votes than did Climate Services.

Instrumentation and Observation (9 votes) received the fourth highest number of priority votes, although all of the votes for this topic were either as the second or the fourth priority.

BIP-M (6 votes) received the fifth highest number of priority votes, followed by Aeronautical Meteorology, BIP-MT, and Hydrology and Hydrometeorology, all of which received 5 votes.

Agrometeorology, and IT, Computing, and Data Processing, both of which received 4 votes, completed Region II's top ten list.

Figure 53 shows the seven training topics that received the highest number of priority votes from the Region II respondents to the 2017 survey.



**Figure 53. Top seven training priorities according to the Region II respondents to the 2017 survey**

Figures 52 and 53 show that Region II's training priorities remained much the same from 2017 to 2021.

According to the respondents to both surveys, the highest priority training areas were Weather Forecasting, Climate Services, Instrumentation and Observation, and Atmospheric Modelling and NWP.

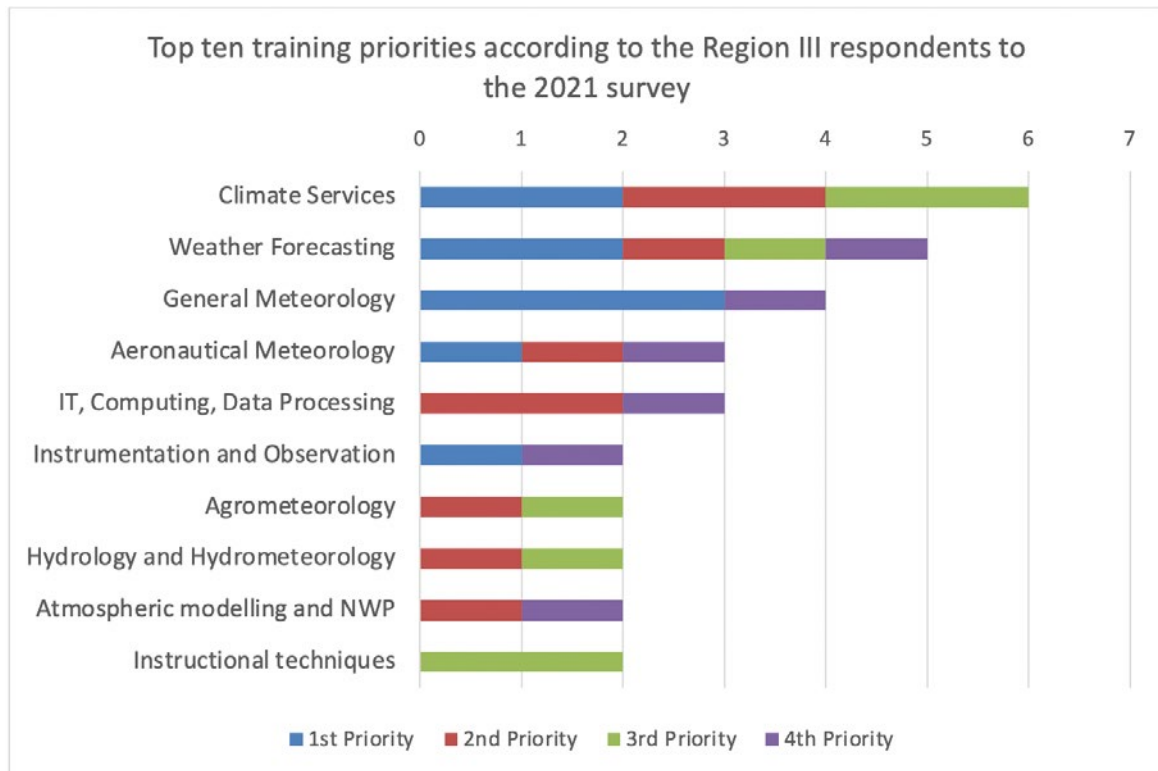
Agrometeorology, Hydrology and Hydrometeorology, and IT, Computing, and Data Processing were also important.

BIP-M, BIP-MT, and Aeronautical Meteorology were among the top priorities for the Region II respondents to the 2021 survey but not for the Region II respondents to the 2017 survey.

Management and Administration Skills were among the top priorities for the Region II respondents to the 2017 survey but not for the Region II respondents to the 2021 survey.

### **Region III**

Figure 54 shows the ten training topics that received the highest number of priority votes from the Region III respondents to the 2021 survey.



**Figure 54. Top ten training priorities according to the Region III respondents to the 2021 survey**

Figure 54 shows that for Region III, Climate Services received the highest number of priority votes overall (6 votes), followed by Weather Forecasting (5 votes). General Meteorology received the third highest number of priority votes (4 votes); however, it received the highest number of first-priority votes.

Aeronautical Meteorology, and IT, Computing, and Data Processing were tied for the second most frequently selected training priority, with 3 votes.

Five topics all received two priority votes:

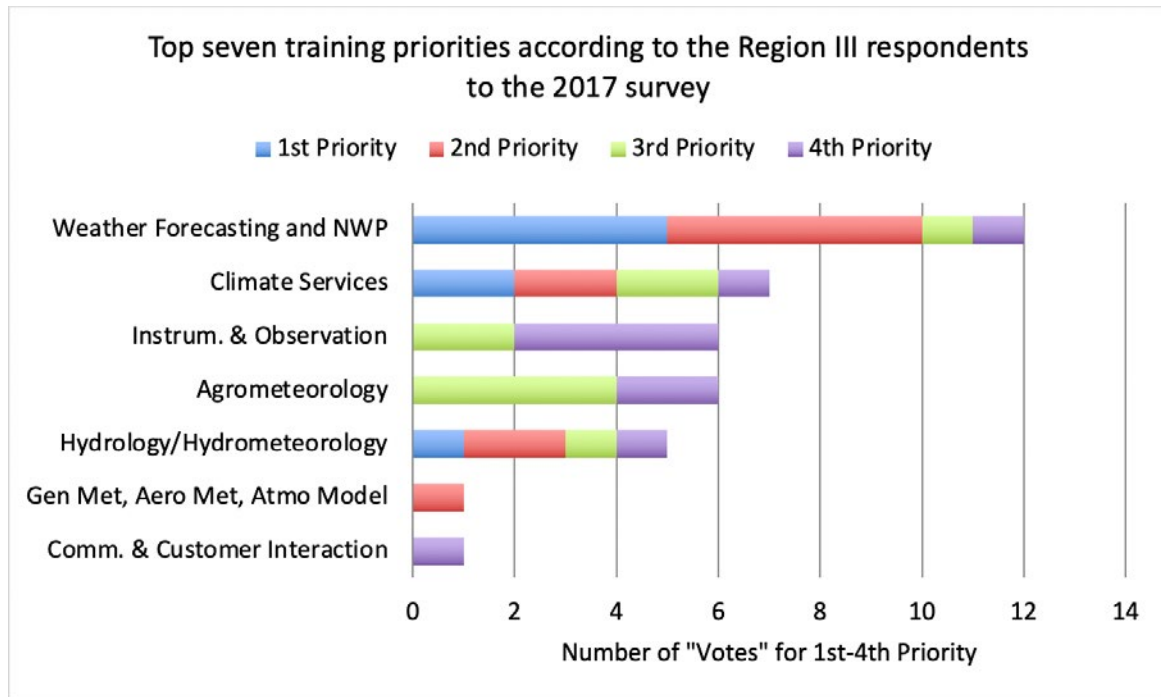
Instrumentation and Observation received one first-priority vote and one fourth-priority vote.

Agrometeorology and Hydrology and Hydrometeorology each received one second-priority vote and one third-priority vote.

Atmospheric Modelling and NWP received one second-priority vote and one fourth-priority vote.

Instructional techniques for online and face-to-face training received two third-priority votes.

Figure 55 shows the seven training topics that received the highest number of priority votes from the Region III respondents to the 2017 survey.



**Figure 55. Top seven training priorities according to the Region III respondents to the 2017 survey**

Figures 54 and 55 show that Region III's training priorities remained much the same from 2017 to 2021.

According to the respondents to both surveys, the highest priority training areas were Weather Forecasting and Climate Services. General Meteorology was also among the top training priorities for the respondents to both surveys but increased in importance in 2021, receiving the highest number of first-priority votes of all training areas for the Region III respondents to the 2021 survey.

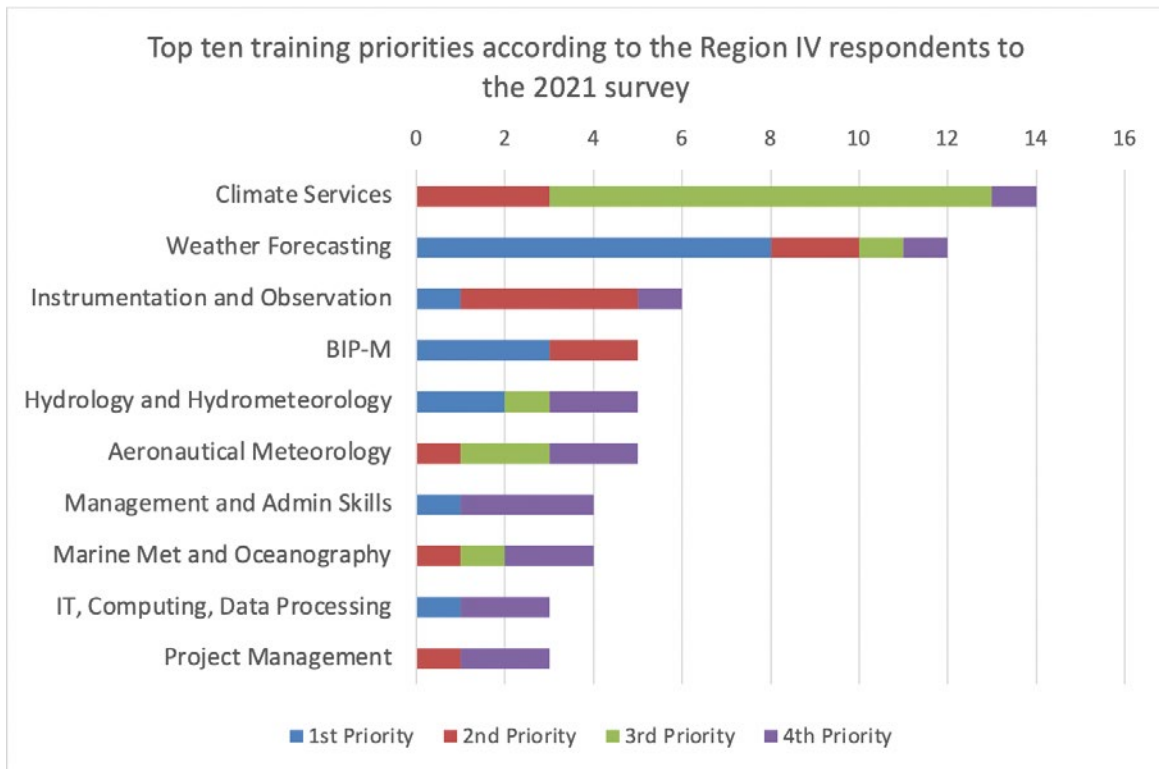
Aeronautical Meteorology and IT, Computing, and Data Processing were also important.

Instructional Techniques was one of the top priorities for the Region III respondents to the 2021 survey but not for the Region III respondents to the 2017 survey.

Communications and Customer Interactions was one of the top priorities for the Region III respondents to the 2017 survey but not for the Region III respondents to the 2021 survey.

### **Region IV**

Figure 56 shows the ten training topics that received the highest number of priority votes according to the Region IV respondents to the 2021 survey.



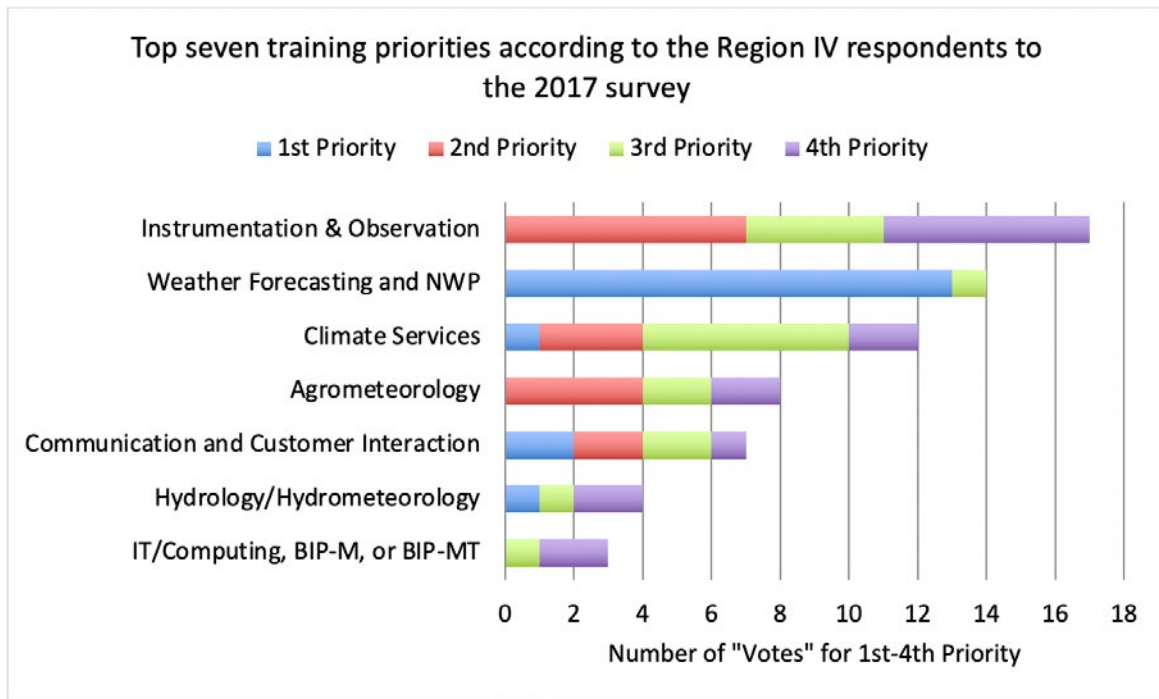
**Figure 56. Top ten training priorities according to the Region IV respondents to the 2021 survey**

Figure 56 shows that for Region IV, Climate Services received the highest number of priority votes overall (14 votes), followed by Weather Forecasting (12 votes). However, Weather Forecasting received the highest number of first-priority votes.

Instrumentation and Observation (6 votes) received the third highest number of priority votes, followed by BIP-M, Hydrology and Hydrometeorology, and Aeronautical Meteorology, each of which received 5 votes. BIP-M received the second highest number of first-priority votes of all the topics according to the Region IV respondents.

Management and Administration Skills (4 votes), Marine Meteorology and Oceanography (4 votes), IT, Computing, and Data Processing (3 votes), and Project Management (3 votes) completed Region IV's top ten list.

Figure 57 shows the seven training topics that received the highest number of priority votes from the Region IV respondents to the 2017 survey.



**Figure 57. Top seven training priorities according to the Region IV respondents to the 2017 survey**

Figures 56 and 57 show that Region IV's training priorities remained much the same from 2017 to 2021.

According to the respondents to both surveys, the highest priority training areas were Weather Forecasting, Climate Services, and Instruments and Observations.

BIP-M, Hydrology and Hydrometeorology, Aeronautical Meteorology, and IT, Computing, and Data Processing were also important.

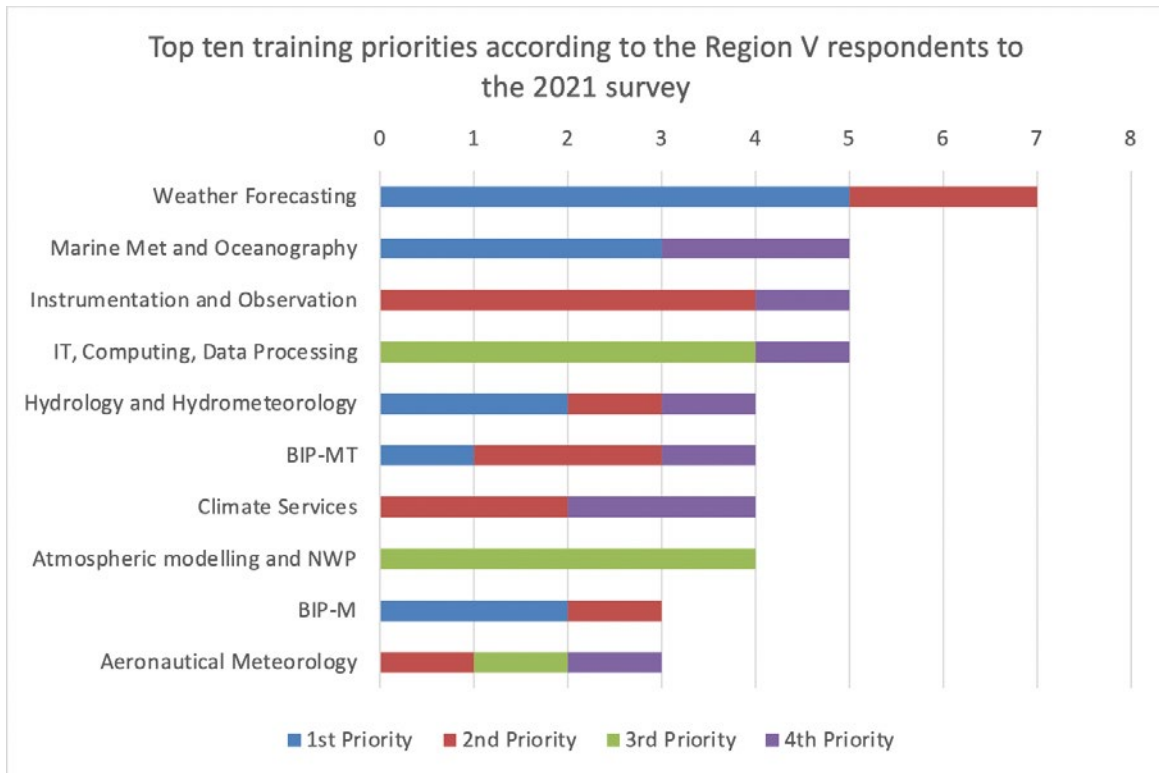
Management and Administration Skills, Marine Meteorology and Oceanography, and Project Management were among the top priorities for the Region IV respondents to the 2021 survey but for not the Region I respondents to the 2017 survey.

Agrometeorology was one of the top priorities for the Region IV respondents to the 2017 survey but not for the Region I respondents to the 2021 survey.

### **Region V**

Figure 58 shows the ten training topics that received the highest number of priority votes from the Region V respondents to the 2021 survey.





**Figure 58. Top ten training priorities according to the Region V respondents to the 2021 survey**

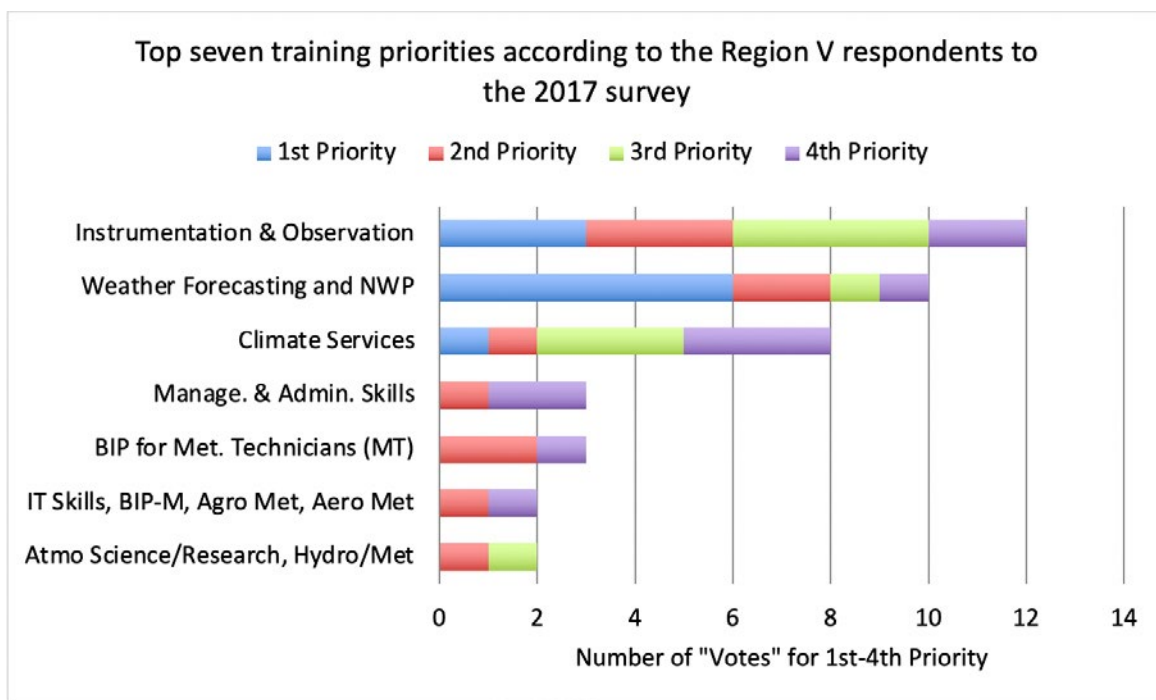
Figure 58 shows that for Region V, Weather Forecasting received the highest number of priority votes overall (7 votes), as well as the most first-priority votes.

Marine Meteorology and Oceanography, Instrumentation and Observation, and IT, Computing, and Data Processing all received 5 votes.

Hydrology and Hydrometeorology, BIP-MT, Climate Services, and Atmospheric Modelling and NWP all received 4 votes.

BIP-M and Aeronautical Meteorology completed Region V's top ten list.

Figure 59 shows the seven training topics that received the highest number of priority votes from the Region V respondents to the 2017 survey.



**Figure 59. Top seven training priorities according to the Region V respondents to the 2017 survey**

Figures 58 and 59 show that Region V's training priorities remained much the same from 2017 to 2021.

According to the respondents to both surveys, the top training area was Weather Forecasting.

Interestingly, although Marine Meteorology and Oceanography was the second highest priority training area for the Region V respondents to the 2021 survey, it was not among the top priorities for the Region V respondents to the 2017 survey. The Region V respondents did not volunteer this topic in the free-response question in 2017 survey, but they did select it from the list of topics in the 2021 survey.

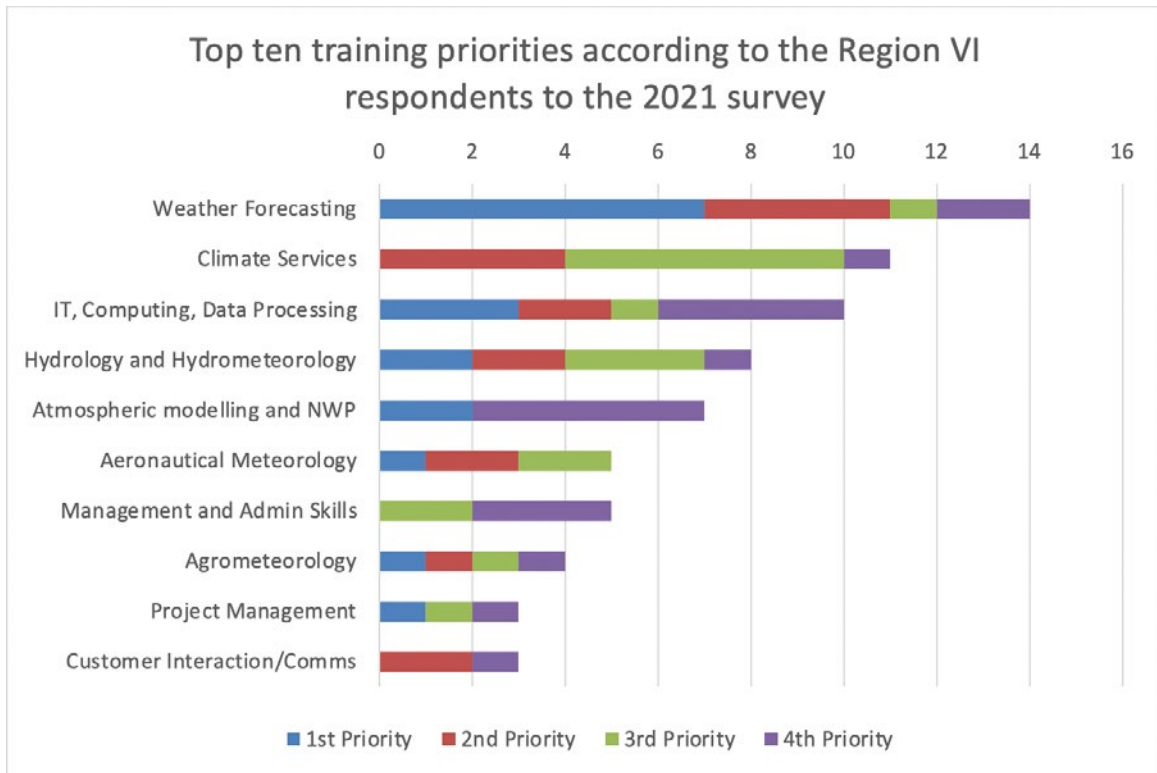
Instrumentation and Observation was also a top training area for the Region V respondents to both surveys.

IT, Computing, and Data Processing; Hydrology and Hydrometeorology; BIP-MT; Climate Services; and Atmospheric Modelling and NWP were also important for the respondents to both surveys.

Management and Administration Skills was one of the top priorities for the Region V respondents to the 2017 survey but not for the Region V respondents to the 2021 survey.

## **Region VI**

Figure 60 shows the ten training topics that received the highest number of priority votes from the Region VI respondents to the 2021 survey.



**Figure 60. Top ten training priorities according to the Region VI respondents to the 2021 survey**

Figure 60 shows that for Region VI, Weather Forecasting received the highest number of priority votes overall (14 votes), as well as the most first-priority votes.

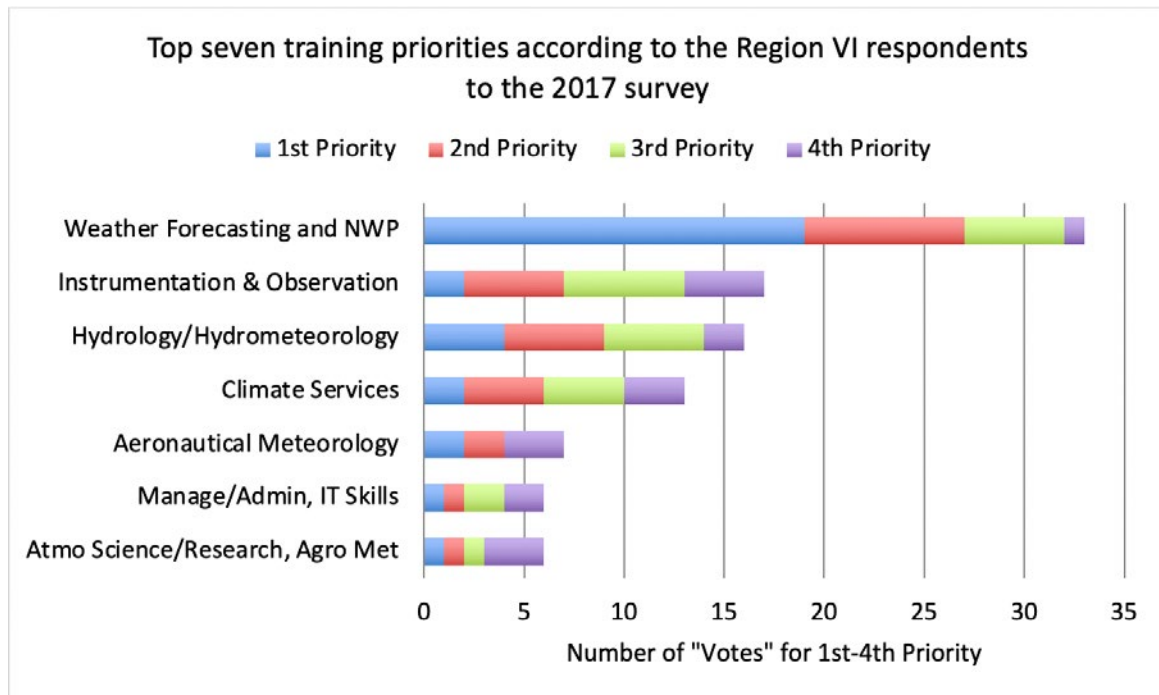
Climate Services received the second highest number of priority votes (11 votes), followed by IT, Computing, and Data Processing (10 votes). IT, Computing, and Data Processing received more first-priority votes than did Climate Services.

Hydrology and Hydrometeorology (8 votes) received the fourth highest number of priority votes, and Atmospheric Modelling and NWP (7 votes) received the fifth highest number of priority votes.

Aeronautical Meteorology and Management and Administration Skills both received 5 priority votes.

Agrometeorology, Project Management, and Customer Interactions and Communications completed Region VI's top ten list.

Figure 61 shows the seven training topics that received the highest number of priority votes from the Region VI respondents to the 2017 survey.



**Figure 61. Top seven training priorities according to the Region VI respondents to the 2017 survey**

Figures 60 and 61 show that Region VI's training priorities changed somewhat from 2017 to 2021.

According to the respondents to both surveys, the highest priority training areas were Weather Forecasting, Climate Services, Hydrology and Hydrometeorology, and Atmospheric Modelling and NWP.

IT, Computing, and Data Processing increased in importance: in 2021, it received the third highest number of priority votes overall and the second highest number of first-priority votes from the respondents to the 2021 survey.

Although Instrumentation and Observation was the second highest priority training area for the Region VI respondents to the 2017 survey, it was not among the top priorities for the Region VI respondents to the 2021 survey.

Aeronautical Meteorology, Management and Administration Skills, and Agrometeorology were among the top priorities for the respondents to both surveys.

Atmospheric Science and Research was among the top priorities for the respondents to the 2017 survey but not for the respondents to the 2021 survey.

Project Management and Customer Interactions and Communications were among the top priorities for the respondents to the 2021 survey but not for the respondents to the 2017 survey. (Project Management was even the first training priority for one 2021 survey respondent.)

#### 2.2.5 ***Completion of the Basic Instruction Package for Meteorologists (BIP-M) by personnel engaged in service provision***

##### **Major findings**

At the time of the 2021 survey, globally, 81% of the respondents indicated that at least some of their NMHS staff members providing meteorology services had completed the Basic Instruction Package for Meteorologists (BIP-M), and 49% of the respondents indicated that all of their NMHS staff members providing meteorology services had completed it.



**Table 55. Percentage of respondents that indicated each level of completion for the BIP-MT**

Completion status	Region						Global
	I	II	III	IV	V	VI	
Yes, in full	48%	60%	22%	44%	43%	41%	43%
Yes, in part	35%	28%	56%	28%	29%	41%	36%
No	15%	4%	22%	17%	21%	15%	16%
Completion not indicated	2%	8%	0%	11%	7%	4%	5%
Total percentage	100%	100%	100%	100%	100%	100%	100%

**Table 56. Percentage of respondents that indicated each level of completion for the BIP-H**

Completion status	Region						Global
	I	II	III	IV	V	VI	
Yes, in full	9%	0%	11%	0%	0%	19%	6%
Yes, in part	13%	32%	11%	11%	21%	15%	17%
No	54%	52%	56%	61%	64%	37%	54%
Completion not indicated	24%	16%	22%	28%	14%	30%	22%
Total percentage	100%	100%	100%	100%	100%	100%	100%

**Table 57. Percentage of respondents that indicated each level of completion for the BIP-HT**

Completion status	Region						Global
	I	II	III	IV	V	VI	
Yes, in full	9%	4%	0%	0%	0%	15%	5%
Yes, in part	17%	20%	22%	11%	21%	19%	18%
No	50%	60%	56%	61%	64%	37%	55%
Completion not indicated	24%	16%	22%	28%	14%	30%	22%
Total percentage	100%	100%	100%	100%	100%	100%	100%

Figures 62 and 63 depict the same information that is presented in Tables 53 through 56: the global and regional completion levels for the Basic Instructional Packages.

In Figure 62, the chart with blue bars shows the respondents' completion rates for the BIP-M, and the chart with orange bars shows the respondents' completion rates for the BIP-MT.

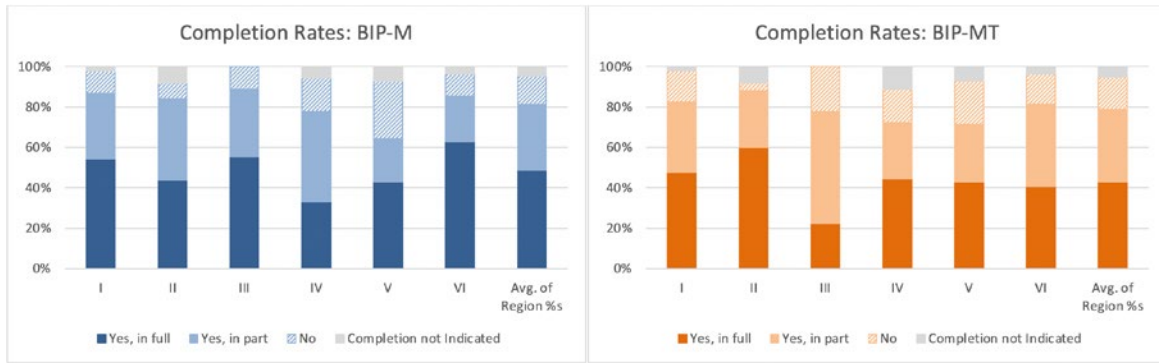
In Figure 63, the chart with red bars shows the respondents' completion rates for the BIP-H, and the chart with purple bars shows the respondents' completion rates for the BIP-HT.

In all four charts, the dark-coloured segments represent the percentage of respondents that indicated that all of their NMHS staff members providing the relevant services had completed that Basic Instructional Package.

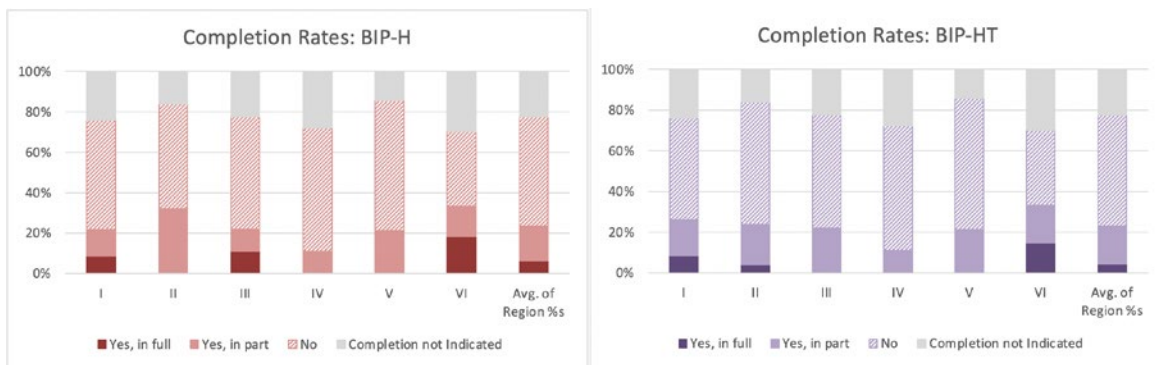
The light-coloured segments represent the percentage of respondents that indicated that some of their NMHS staff members providing the relevant services had completed that Basic Instructional Package.

The narrow-striped segments represent the percentage of respondents that indicated that none of their NMHS staff members providing the relevant services had completed that Basic Instructional Package.

The pale grey segments represent the percentage of respondents that did not provide information regarding how many of their NMHS staff members had completed that Basic Instructional Package.



**Figure 62. Regional and global completion rates for the BIP-M and the BIP-MT, according to the 2021 survey respondents**



**Figure 63. Regional and global completion rates for the BIP-H and the BIP-HT, according to the 2021 survey respondents**

**Global**

*BIP-M*

At the time of the survey, 49% of the global respondents indicated that all of their NMHS staff members providing meteorology services had completed the BIP-M, and 32% indicated that some of their NMHS staff members providing meteorology services had completed it. Thus, at the time of the survey, most of the global respondents (81%) indicated that at least some of their NMHS staff members providing meteorology services had completed the BIP-M.

Fourteen per cent of the global respondents indicated that none of their NMHS staff members providing meteorology services had completed the BIP-M, and 4% did not share information regarding the completion of the BIP-M by their NMHS staff members.

*BIP-MT*

At the time of the survey, 43% of the global respondents indicated that all of their NMHS staff members providing meteorological technician services had completed the BIP-MT, and 36% indicated that some of their NMHS staff members providing meteorological technician services had completed it. Thus, most of the global respondents (79%) indicated that at least some of their NMHS staff members providing meteorological technician services had completed the BIP-MT.

Sixteen per cent of the global respondents indicated that none of their NMHS staff members providing meteorological technician services had completed the BIP-MT, and 5% did not share information regarding the completion of the BIP-MT by their NMHS staff members.

*BIP-H*

At the time of the survey, 6% of the global respondents indicated that all of their NMHS staff members providing hydrology services had completed the BIP-H, and 17% indicated that some of their NMHS staff members providing hydrology services had completed it. Thus, one quarter of the global respondents (24%) indicated that at least some of their NMHS staff members providing hydrology services had completed the BIP-H.

The majority of the global respondents (54%) indicated that none of their NMHS staff members providing hydrology services had completed the BIP-H, and 22% did not share information regarding the completion of the BIP-H by their NMHS staff members.

*BIP-HT*

At the time of the survey, 5% of the global respondents indicated that all of their NMHS staff members providing hydrological technician services had completed the BIP-HT, and 18% indicated that some of their NMHS staff members providing hydrological technician services had completed it. Thus, about one quarter of the global respondents (23%) indicated that at least some of their NMHS staff members providing hydrological technician services had completed the BIP-HT.

The majority of the global respondents (55%) indicated that none of their NMHS staff members providing hydrological technician services had completed the BIP-HT, and 22% did not share information regarding the completion of the BIP-HT by their NMHS staff members.

**Maps**

Maps 12 through 15 show the situation regarding the completion of the Basic Instructional Packages by the Members' relevant NMHS staff members at the time of the survey, as reported by the survey respondents.

Members whose respondents indicated that all of their NMHS staff members providing the relevant services had completed the Basic Instructional Package in full are shaded dark blue.

Members whose respondents indicated that some of their NMHS staff members providing the relevant services had completed the Basic Instructional Package in part are shaded light blue.

Members whose respondents indicated that none of their NMHS staff members providing the relevant services had completed the Basic Instructional Package are shaded yellow.

Members that did not respond to the survey or that did provide information about the completion of the Basic Instructional Package are shaded pale grey.

*Map 12. BIP-M completion*

The dark blue shading illustrates that half of the global respondents indicated that all of their NMHS staff members providing meteorology services had completed the BIP-M at the time of the survey.

The light and dark blue shading, considered together, illustrate that most of the global respondents (just over 80%) indicated that at least some of their NMHS staff members providing meteorology services had completed the BIP-M at the time of the survey.

The yellow shading illustrates that in each region, there were Members whose respondents indicated none of their NMHS staff members providing meteorology services had completed the BIP-M.



*Map 13. BIP-MT completion*

The dark blue shading illustrates that 43% of the global respondents indicated that all of their NMHS staff members providing meteorological technician services had completed the BIP-MT.

The light and dark blue shading, considered together, illustrate that most of the global respondents (almost 80%) indicated that at least some of their NMHS staff members providing meteorological technician services had completed the BIP-MT.

The yellow shading illustrates that in each region there were Members whose respondents indicated none of their NMHS staff members providing meteorological technician services had completed the BIP-MT.

*Map 14. BIP-H completion*

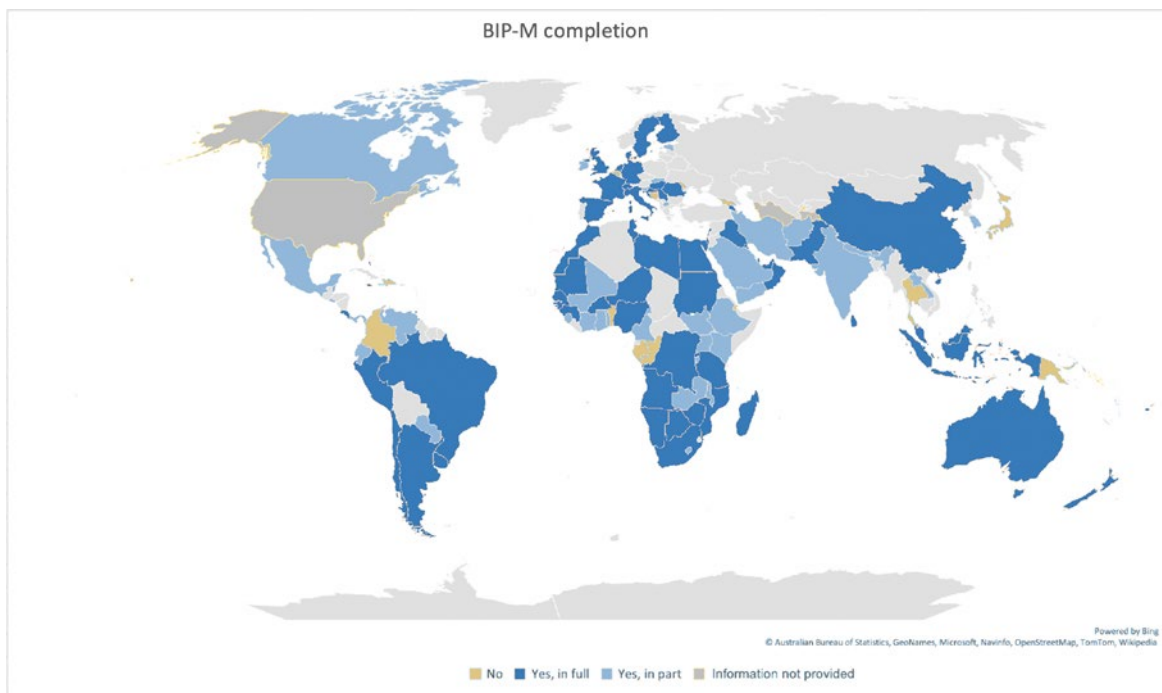
The predominantly yellow and grey shading illustrate that most of the respondents either indicated that none of their NMHS staff members providing hydrology services had completed the BIP-H or did not provide information about the completion of this instructional package.

The light and dark blue shading illustrate that in each region, there were Members whose respondents indicated that at least some of their NMHS staff members providing hydrology services had completed the BIP-H.

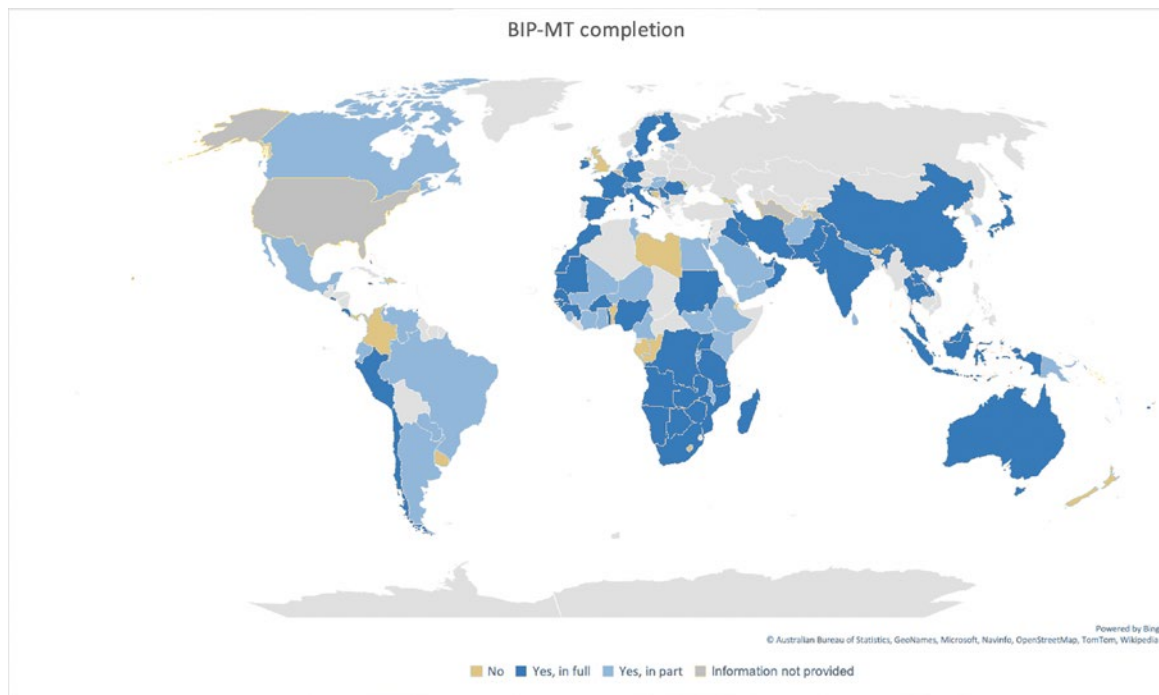
*Map 15. BIP-HT completion*

The predominantly yellow and grey shading illustrate that most of the respondents either indicated that none of their NMHS staff members providing hydrological technician services had completed the BIP-HT or did not provide information about the completion of this instructional package.

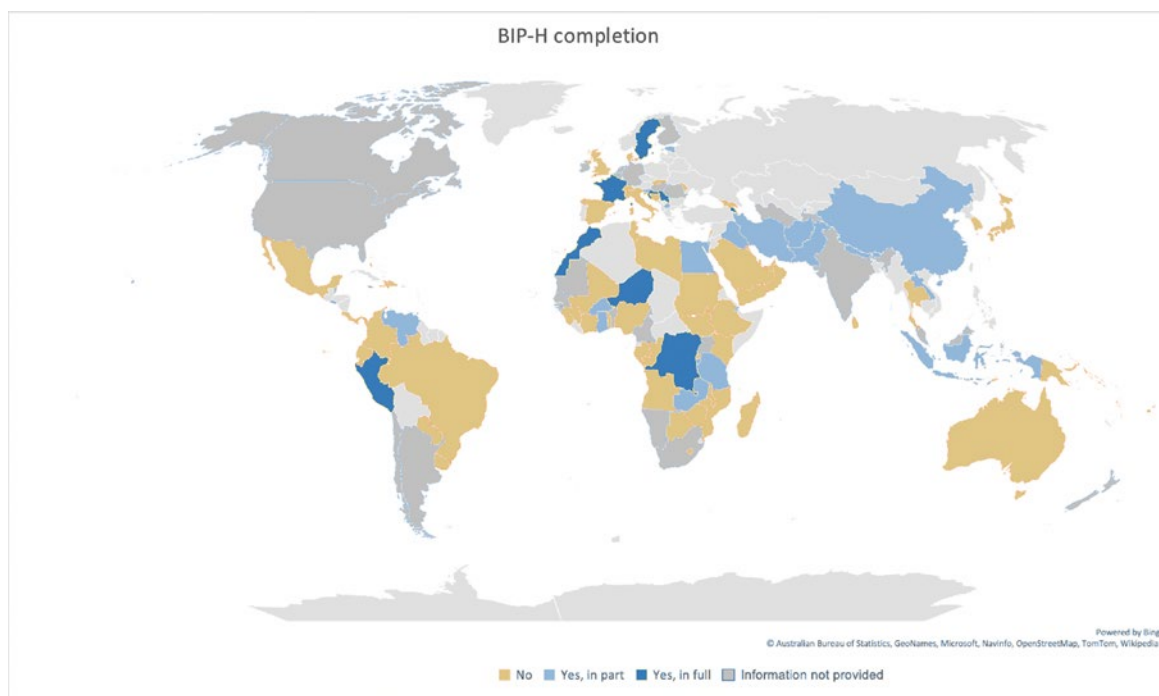
The light and dark blue shading illustrate that in each region, there were Members whose respondents indicated that at least some of their NMHS staff members providing hydrological technician services had completed the BIP-HT.



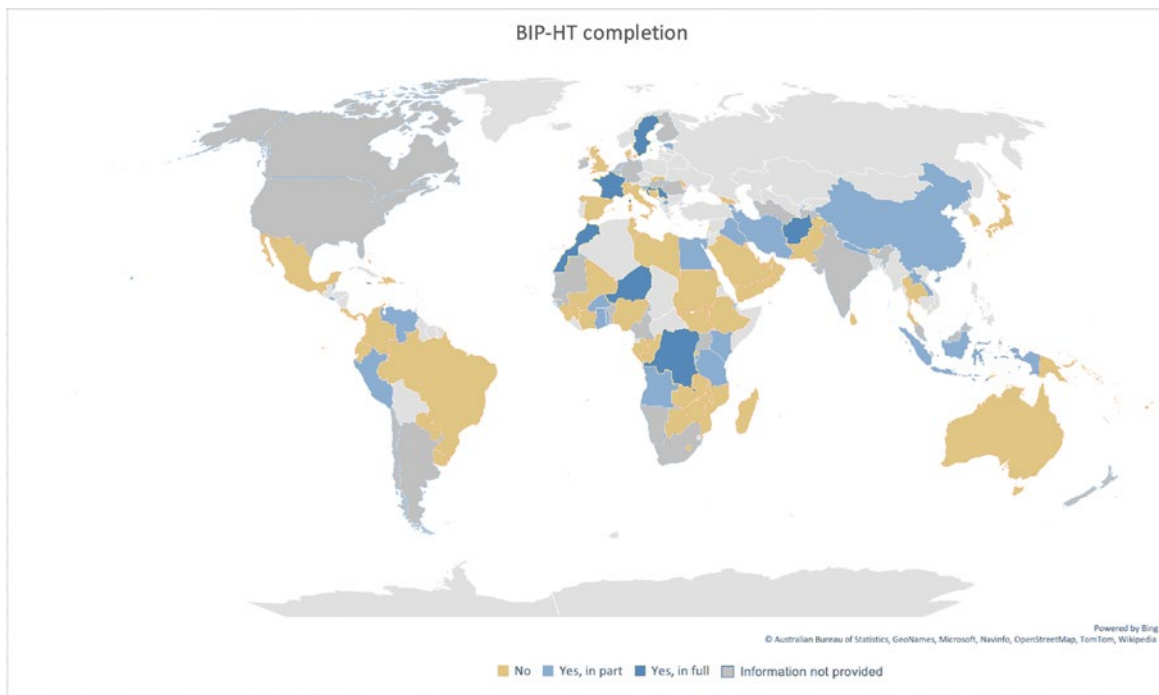
**Map 12. BIP-M completion**



Map 13. BIP-MT completion



Map 14. BIP-H completion



Map 15. BIP-HT completion

#### 2.2.6 ***Training and assessment of personnel on WMO competency frameworks***

##### **Major findings – Overall**

- At the time of the survey, five of the WMO competency frameworks had been implemented at least in part by the NMHSs according to a majority of survey respondents (60% or more): Aeronautical Meteorological Forecaster, Aeronautical Meteorological Observer, Meteorological Observations (OBS), Personnel – Operational Forecasting (PWS), and Satellite for Operational Meteorologists.
- In order to provide information concerning the responses of a majority of the survey respondents in the area of assessment frequency, all assessment frequencies, including the longest assessment frequency of once every five years or more, were taken into account.
  - At the time of the survey, three competency frameworks were being assessed once every five years or more according to about 60% of the respondents: Aeronautical Meteorological Forecaster, Aeronautical Meteorological Observer, and Meteorological Observations (OBS).
- As Members continue to familiarize themselves with the competency frameworks, implementation levels and assessment frequencies are likely to increase.
- In particular, the implementation level and assessment frequency of the Provision of Climate Services competency framework are likely to advance greatly in the near future since Climate Services was one of the top two areas in which NMHS staff training was needed (at the time of the survey, according to the respondents).
  - At the time of the survey, Provision of Climate Services had been implemented in full by only 8% of the respondents' NMHSs; it had been implemented at least in part by 46% of the respondents' NMHSs.
  - At the time of the survey, Provision of Climate Services was being assessed more than once a year by 11% of the respondents and at least every one or two years by 24% of the respondents' NMHSs. It was being assessed once every five years or more by 32% of the respondents' NMHSs.

2.2.6.1 **Status of implementation****Major findings**

The competency frameworks were sorted into four sets of implementation levels.

1. In full: about 40% of the respondents' NMHSs  
At least in part: about 75% of the respondents' NMHSs
  - Aeronautical Meteorological Forecaster
  - Aeronautical Meteorological Observer
  - Meteorological Observations (OBS)
2. In full: 20% to 30% of the respondents' NMHSs  
At least in part: about 60% of the respondents' NMHSs
  - Personnel – Operational Forecasting (PWS)
  - Satellite for Operational Meteorologists
3. In full: 10% to 20% of the respondents' NMHSs  
At least in part: 35% to 50% of the respondents' NMHSs
  - Instrumentation (OBS)
  - Calibration (OBS)
  - Radar for Operational Meteorologists
  - Advisors – Disaster Prevention/Mitigation (PWS)
  - Observing Program and Network Management (OBS)
  - Weather Broadcasters & Communicators (PWS)
  - Marine Weather Forecasters
4. In full: fewer than 10% of the respondents' NMHSs  
At least in part: 35% to 50% of the respondents' NMHSs
  - Provision of Climate Services
  - Education and Training Providers
  - WMO Information System Competencies
  - Meeting User Requirements (PWS)

**Detailed results**

Table 58 shows the number of responses regarding competency framework implementation. The frameworks are listed in the order in which they were presented on the survey form.

**Table 58. Number of responses regarding competency framework implementation**

Competency framework	Region						Global
	I	II	III	IV	V	VI	
1. Aeronautical Meteorological Forecaster	45	23	9	18	14	24	133
2. Aeronautical Meteorological Observer	45	23	9	17	14	24	132
3. Provision of Climate Services	41	22	9	18	11	24	125
4. Marine Weather Forecasters	41	22	7	18	13	22	123
5. WMO Information System Competencies	41	21	8	16	12	24	122
6. Education and Training Providers	40	22	7	17	13	23	122
7. Personnel – Operational Forecasting (PWS)	41	23	8	16	13	25	126
8. Weather Broadcasters & Comms (PWS)	41	22	8	16	13	24	124
9. Advisors – Disaster Prevent./Mitigat. (PWS)	40	21	8	17	12	24	122
10. Meeting User Requirements (PWS)	40	20	8	16	11	24	119

Competency framework	Region						Global
	I	II	III	IV	V	VI	
11. Meteorological Observations (OBS)	44	23	9	18	12	25	131
12. Instrumentation (OBS)	43	22	8	17	13	25	128
13. Calibration (OBS)	42	22	8	18	13	25	128
14. Observing Prog. and Network Mgmt. (OBS)	42	21	8	17	13	25	126
15. Satellite for Operational Meteorologists	42	23	9	18	13	25	130
16. Radar for Operational Meteorologists	41	23	8	18	13	25	128
Total survey respondents	46	25	9	18	14	27	139

Table 58 shows that most of the survey respondents shared information about their implementation of the WMO competency frameworks (119 to 133 of the 139 survey respondents).

Tables 59 and 60 show the number and percentage of respondents that indicated the implementation status of each competency framework. The tables are sorted by implementation in full, then by implementation in part.

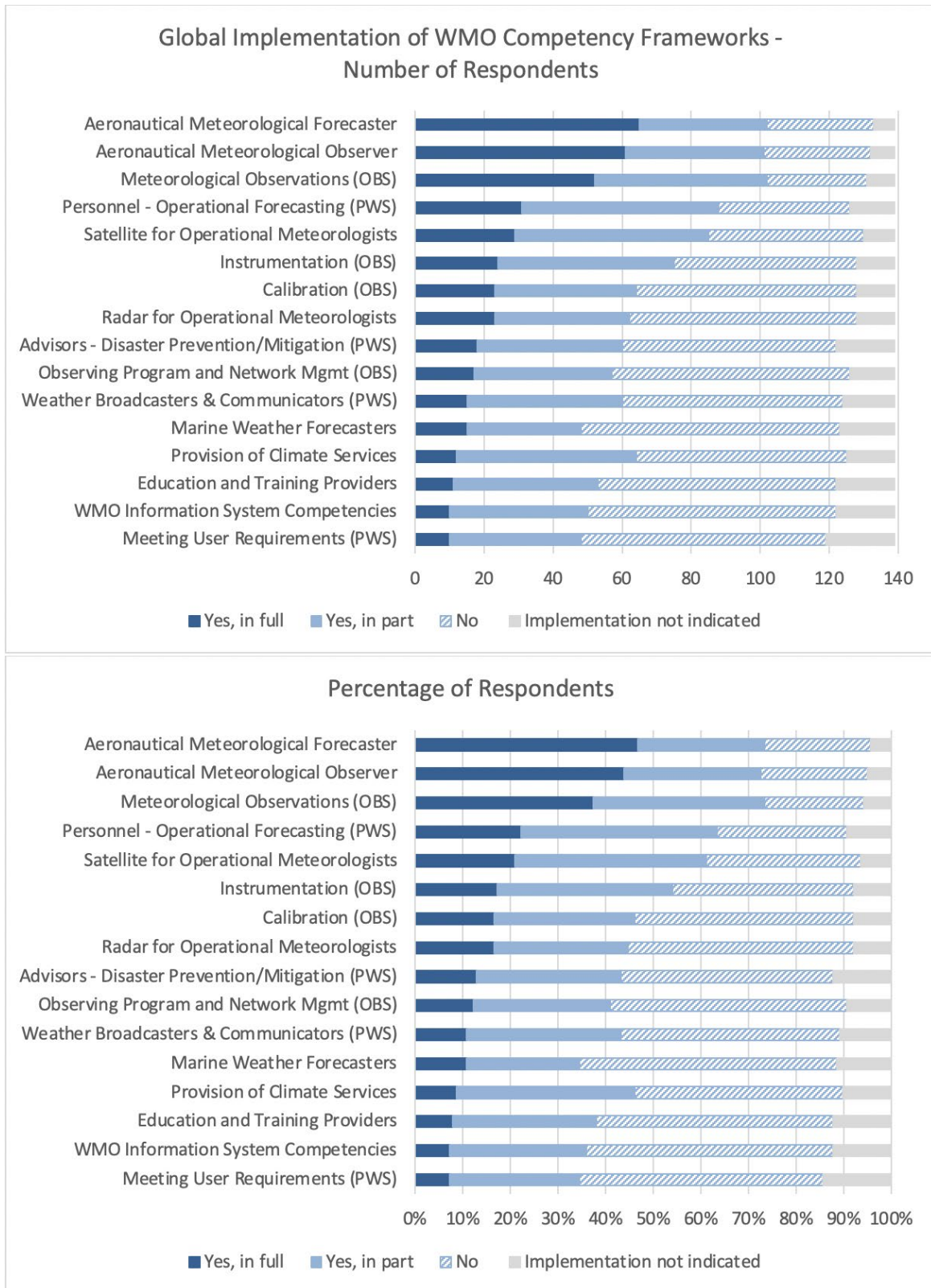
Figure 64 depicts the same information that is shown in in Tables 59 and 60: the number and percentage of respondents that indicated the implementation status of each competency framework. The charts in the figure are also sorted by implementation in full, then by implementation in part.

**Table 59. Number of respondents that indicated the implementation status of each competency framework**

Competency frameworks	Yes, in full	Yes, in part	No	Impl. not indicated
1. Aeronautical Meteorological Forecaster	65	37	31	6
2. Aeronautical Meteorological Observer	61	40	31	7
3. Meteorological Observations (OBS)	52	50	29	8
4. Personnel – Operational Forecasting (PWS)	31	57	38	13
5. Satellite for Operational Meteorologists	29	56	45	9
6. Instrumentation (OBS)	24	51	53	11
7. Calibration (OBS)	23	41	64	11
8. Radar for Operational Meteorologists	23	39	66	11
9. Advisors – Disaster Prevention/Mitigation (PWS)	18	42	62	17
10. Observing Program and Network Mgmt (OBS)	17	40	69	13
11. Weather Broadcasters & Communicators (PWS)	15	45	64	15
12. Marine Weather Forecasters	15	33	75	16
13. Provision of Climate Services	12	52	61	14
14. Education and Training Providers	11	42	69	17
15. WMO Information System Competencies	10	40	72	17
16. Meeting User Requirements (PWS)	10	38	71	20

**Table 60. Percentage of respondents that indicated the implementation status of each competency framework**

<i>Competency framework</i>	<i>Yes, in full</i>	<i>Yes, in part</i>	<i>No</i>	<i>Impl. not indicated</i>
1. Aeronautical Meteorological Forecaster	47%	27%	22%	4%
2. Aeronautical Meteorological Observer	44%	29%	22%	5%
3. Meteorological Observations (OBS)	37%	36%	21%	6%
4. Personnel – Operational Forecasting (PWS)	22%	41%	27%	9%
5. Satellite for Operational Meteorologists	21%	40%	32%	6%
6. Instrumentation (OBS)	17%	37%	38%	8%
7. Calibration (OBS)	17%	29%	46%	8%
8. Radar for Operational Meteorologists	17%	28%	47%	8%
9. Advisors – Disaster Prevention/Mitigation (PWS)	13%	30%	45%	12%
10. Observing Program and Network Mgmt (OBS)	12%	29%	50%	9%
11. Weather Broadcasters & Communicators (PWS)	11%	32%	46%	11%
12. Marine Weather Forecasters	11%	24%	54%	12%
13. Provision of Climate Services	9%	37%	44%	10%
14. Education and Training Providers	8%	30%	50%	12%
15. WMO Information System Competencies	7%	29%	52%	12%
16. Meeting User Requirements (PWS)	7%	27%	51%	14%



**Figure 64. Global implementation rates for the WMO competency frameworks: number and per cent of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**

Tables 59 and 60 and Figure 64 show that the extent to which the competency frameworks were implemented varied.

The frameworks can be grouped into the following four sets of implementation levels based on the percentage of respondents that indicated that their NMHSs had implemented them in full at the time of the survey: implemented in full by about 40% of the respondents' NMHSs; implemented in full by 20% to 30% of the respondents' NMHSs; implemented in full by 10% to 20% of the respondents' NMHSs; implemented in full by fewer than 10% of the respondents' NMHSs.

*Implemented in full by about 40% of the respondents' NMHSs*

Aeronautical Meteorological Forecaster and Aeronautical Meteorological Observer had been implemented in full by about 45% of the respondents' NMHSs at the time of the survey.

Meteorological Observations (OBS) had been implemented in full by 37% of the respondents' NMHSs at the time of the survey.

All three of these competency frameworks had been implemented at least in part by almost three quarters (73%) of the respondents' NMHSs at the time of the survey.

About 20% of the respondents indicated that their NMHSs had not implemented these three competency frameworks at the time of the survey. (Only those respondents that shared information about the level of implementation of the competency frameworks by their NMHSs at the time of the survey were included in this percentage.)

*Implemented in full by 20% to 30% of the respondents' NMHSs*

Another two competency frameworks had been implemented in full by just over 20% of the respondents' NMHSs at the time of the survey: Personnel – Operational Forecasting (PWS) and Satellite for Operational Meteorologists.

These two frameworks had been implemented at least in part by just over 60% of the respondents' NMHSs. About 30% of the respondents' NMHSs had not implemented these two competency frameworks at the time of the survey.

*Implemented in full by 10% to 20% of the respondents' NMHSs*

Seven competency frameworks had been implemented in full by 10% to 20% of the respondents' NMHSs at the time of the survey:

- Instrumentation (OBS)
- Calibration (OBS)
- Radar for Operational Meteorologists
- Advisors – Disaster Prevention/Mitigation (PWS)
- Observing Program and Network Mgmt (OBS)
- Weather Broadcasters & Communicators (PWS)
- Marine Weather Forecasters

These seven frameworks had been implemented at least in part by 35% to 50% of the respondents' NMHSs. Thirty-eight per cent to 54% of the respondents' NMHSs had not implemented these seven competency frameworks at the time of the survey.

*Implemented in full by fewer than 10% of the respondents' NMHSs*

Four competency frameworks had been implemented in full by fewer than 10% of the respondents' NMHSs at the time of the survey:

- Provision of Climate Services
- Education and Training Providers
- WMO Information System Competencies
- Meeting User Requirements (PWS)



These four frameworks had been implemented at least in part by 35% to 46% of the respondents' NMHSs at the time of the survey. About half of the respondents' NMHSs had not implemented these four competency frameworks at the time of the survey.

#### 2.2.6.2 Assessment frequency

##### Major findings

The competency frameworks were sorted into four sets of assessment frequency.

1. At least every one or two years: about 40% of the respondents' NMHSs  
Once every five years or more: about 60% of the respondents' NMHSs
  - Aeronautical Meteorological Observer
  - Meteorological Observations (OBS)
  - Aeronautical Meteorological Forecaster
2. At least every one or two years: 30% of the respondents' NMHSs  
Once every five years or more: 45% of the respondents' NMHSs
  - Satellite for Operational Meteorologists
  - Personnel – Operational Forecasting (PWS)
  - Instrumentation (OBS)
3. At least every one or two years: 20% to 30% of the respondents' NMHSs  
Once every five years or more: about 30% of the respondents' NMHSs
  - Provision of Climate Services
  - Advisors – Disaster Prevention/Mitigation (PWS)
  - Observing Program and Network Management (OBS)
  - Meeting User Requirements (PWS)
  - Calibration (OBS)
  - Radar for Operational Meteorologists
4. At least every one or two years: 10% to 20% of the respondents' NMHSs  
Once every five years or more: 20% to 30% of the respondents' NMHSs
  - Education and Training Providers
  - Weather Broadcasters & Communicators (PWS)
  - WMO Information System Competencies
  - Marine Weather Forecasters

##### Detailed results

Table 61 shows the number of responses regarding the assessment frequency for the competency frameworks. The frameworks are listed in the order in which they were presented on the survey form.

**Table 61. Number of responses regarding the assessment frequency for the competency framework**

Competency framework	Regions						Global
	I	II	III	IV	V	VI	
1. Aeronautical Meteorological Forecaster	35	20	5	16	7	16	99
2. Aeronautical Meteorological Observer	37	18	5	15	7	16	98
3. Provision of Climate Services	23	13	7	7	5	14	69
4. Marine Weather Forecasters	16	10	1	8	6	9	50
5. WMO Information System Competencies	19	12	4	6	4	13	58
6. Education and Training Providers	17	11	3	5	6	12	54
7. Personnel – Operational Forecasting (PWS)	27	14	7	9	6	17	80
8. Weather Broadcasters & Comms (PWS)	21	12	4	3	6	12	58
9. Advisors – Disaster Prevent./Mitigat. (PWS)	21	11	3	3	5	13	56
10. Meeting User Requirements (PWS)	19	10	4	5	5	12	55
11. Meteorological Observations (OBS)	31	16	8	14	6	16	91
12. Instrumentation (OBS)	24	11	5	9	7	14	70
13. Calibration (OBS)	20	11	5	6	7	13	62
14. Observing Prog. and Network Mgmt. (OBS)	16	11	5	5	6	14	57
15. Satellite for Operational Meteorologists	25	14	6	10	7	16	78
16. Radar for Operational Meteorologists	15	14	4	10	6	15	64
Total Survey Respondents	46	25	9	18	14	27	139

Table 61 shows that many of the survey respondents did not share information about their assessment frequency for the WMO competency frameworks.

The nearly 100 respondents that shared assessment information for the first two competency frameworks (Aeronautical Meteorological Forecaster and Aeronautical Meteorological Observer) represent 71% of the global respondents. The 91 respondents that shared assessment information for the Meteorological Observations (OBS) framework represent 65% of the global respondents.

For most of the other competency frameworks, fewer than half of the global respondents shared information regarding their assessment frequency. This is something to keep in mind when considering the results for this topic.

Tables 62 and 63 show the number and percentage of respondents that indicated each assessment frequency. The tables are sorted by the assessment frequency of less than 12 months, then by every 1–2 years.

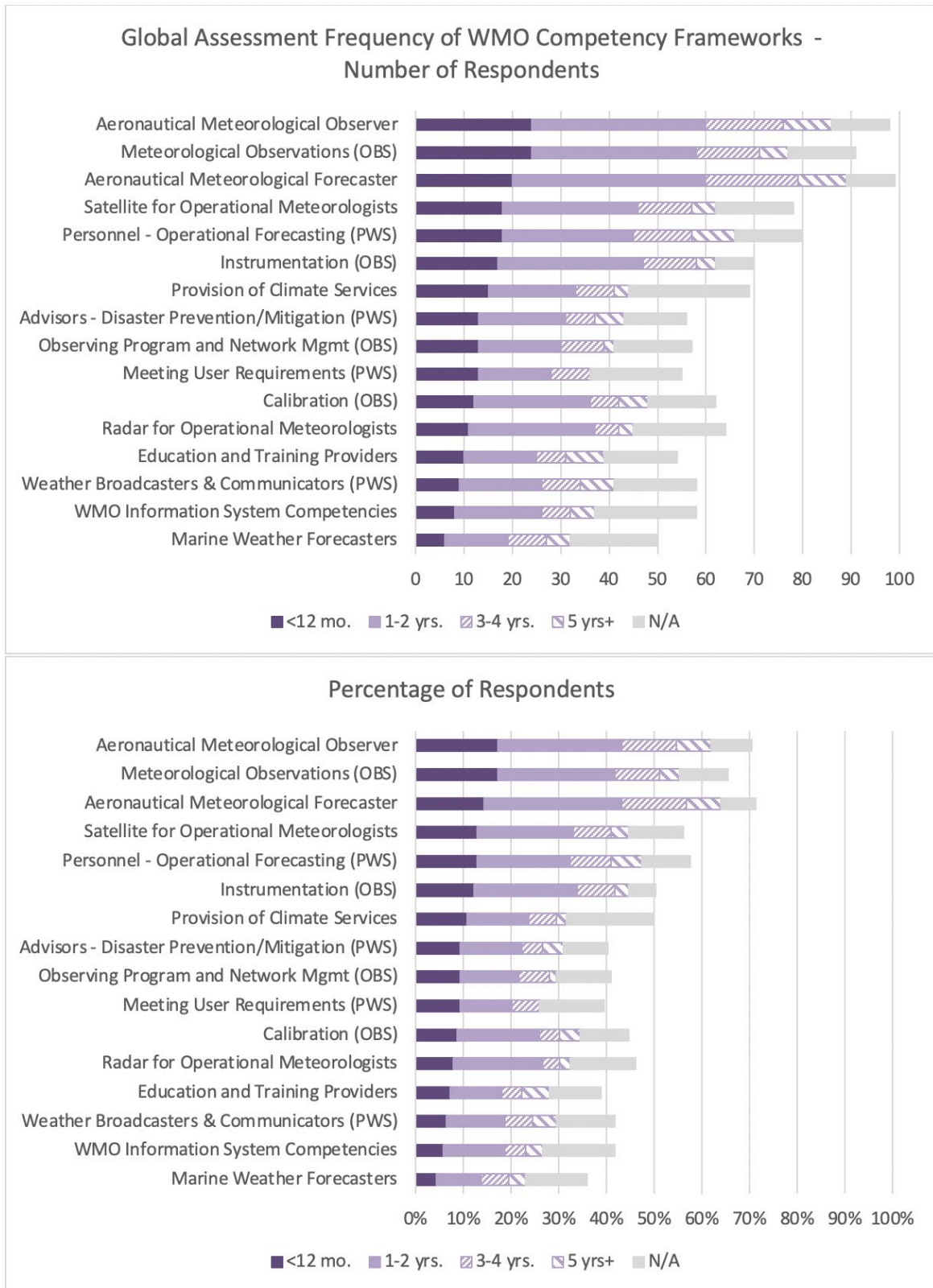
Figure 65 shows the number and percentage of respondents that indicated each assessment frequency. The charts in the figure are also sorted by the assessment frequency of less than 12 months, then by every 1–2 years.

**Table 62. Number of respondents that indicated each assessment frequency**

<i>Competency frameworks</i>	<i>&lt;12 mo.</i>	<i>1–2 y</i>	<i>3–5 y</i>	<i>5 y+</i>	<i>N/A</i>	<i>Total</i>
1. Aeronautical Meteorological Observer	24	36	16	10	12	98
2. Meteorological Observations (OBS)	24	34	13	6	14	91
3. Aeronautical Meteorological Forecaster	20	40	19	10	10	99
4. Satellite for Operational Meteorologists	18	28	11	5	16	78
5. Personnel – Operational Forecasting (PWS)	18	27	12	9	14	80
6. Instrumentation (OBS)	17	30	11	4	8	70
7. Provision of Climate Services	15	18	8	3	25	69
8. Advisors – Disaster Prevent./Mitig. (PWS)	13	18	6	6	13	56
9. Observing Program and Net. Mgmt. (OBS)	13	17	9	2	16	57
10. Meeting User Requirements (PWS)	13	15	8	0	19	55
11. Calibration (OBS)	12	24	6	6	14	62
12. Radar for Operational Meteorologists	11	26	5	3	19	64
13. Education and Training Providers	10	15	6	8	15	54
14. Weather Broadcasters & Comms (PWS)	9	17	8	7	17	58
15. WMO Information System Competencies	8	18	6	5	21	58
16. Marine Weather Forecasters	6	13	8	5	18	50

**Table 63. Percentage of respondents that indicated each assessment frequency**

<i>Competency frameworks</i>	<i>&lt;12 mo.</i>	<i>1–2 y</i>	<i>3–5 y</i>	<i>5 y+</i>	<i>N/A</i>	<i>Total</i>
1. Aeronautical Meteorological Observer	17%	26%	12%	7%	9%	71%
2. Meteorological Observations (OBS)	17%	24%	9%	4%	10%	65%
3. Aeronautical Meteorological Forecaster	14%	29%	14%	7%	7%	71%
4. Satellite for Operational Meteorologists	13%	20%	8%	4%	12%	56%
5. Personnel – Operational Forecasting (PWS)	13%	19%	9%	6%	10%	58%
6. Instrumentation (OBS)	12%	22%	8%	3%	6%	50%
7. Provision of Climate Services	11%	13%	6%	2%	18%	50%
8. Advisors – Disaster Prevent./Mitig. (PWS)	9%	13%	4%	4%	9%	40%
9. Observing Program and Net. Mgmt. (OBS)	9%	12%	6%	1%	12%	41%
10. Meeting User Requirements (PWS)	9%	11%	6%	0%	14%	40%
11. Calibration (OBS)	9%	17%	4%	4%	10%	45%
12. Radar for Operational Meteorologists	8%	19%	4%	2%	14%	46%
13. Education and Training Providers	7%	11%	4%	6%	11%	39%
14. Weather Broadcasters & Comms (PWS)	6%	12%	6%	5%	12%	42%
15. WMO Information System Competencies	6%	13%	4%	4%	15%	42%
16. Marine Weather Forecasters	4%	9%	6%	4%	13%	36%



**Figure 65. Global assessment frequencies for the WMO competency frameworks: number and per cent of respondents that indicated each assessment frequency, sorted by the assessment frequency of less than 12 months, then by every 1–2 years**

Tables 62 and 63 and Figure 65 show that the assessment frequencies of the competency frameworks varied.

The frameworks can be grouped into four sets of assessment frequency in relation to the percentage of respondents that indicated that their NMHS assessed the frameworks at least every one or two years. These sets of assessment frequency are: assessed at least every one or two years by about 40% of the respondents' NMHSs; assessed at least every one or two years by about 30% of the respondents' NMHSs; assessed at least every one or two years by 20% to 30% of the respondents' NMHSs; and assessed at least every one or two years by 10% to 20% of the respondents' NMHSs.

*Assessed at least every one or two years by about 40% of the respondents' NMHSs*

The competency frameworks of Aeronautical Meteorological Forecaster, Meteorological Observations (OBS), and Aeronautical Meteorological Observer were assessed at least every one or two years by about 40% of the respondents' NMHSs.

These three competency frameworks were assessed once every five years or more by around 60% of the respondents' NMHSs.

About 10% of the respondents indicated that an assessment of these three competency frameworks was not applicable to their NMHS. (Only respondents that shared information about their assessment procedures were included in this percentage.)

*Assessed at least every one or two years by about 30% of the respondents' NMHSs*

The competency frameworks of Satellite for Operational Meteorologists, Personnel – Operational Forecasting (PWS), and Instrumentation (OBS) competency frameworks were assessed at least every one or two years by about 30% of the respondents' NMHSs.

These three competency frameworks were assessed once every five years or more by around 45% of the respondents' NMHSs.

About 10% of the respondents indicated that an assessment of these three competency frameworks was not applicable to their NMHS.

*Assessed at least every one or two years by 20% to 30% of the respondents' NMHSs*

Six competency frameworks were assessed at least every one or two years by 20% to 30% of the respondents' NMHSs:

- Provision of Climate Services
- Advisors – Disaster Prevention/Mitigation (PWS)
- Observing Program and Network Management (OBS)
- Meeting User Requirements (PWS)
- Calibration (OBS)
- Radar for Operational Meteorologists

Most of the respondents' NMHSs that assessed these six competency frameworks did so at least every one or two years.

These six competency frameworks were assessed once every five years or more by around 30% of the respondents' NMHSs.

Ten per cent to 18% of the respondents indicated that an assessment of these competency frameworks was not applicable to their NMHS.

*Assessed at least every one or two years by 10% to 20% of the respondents' NMHSs*

Four competency frameworks were assessed at least every one or two years by 10% to 20% of the respondents' NMHSs:

- Education and Training Providers

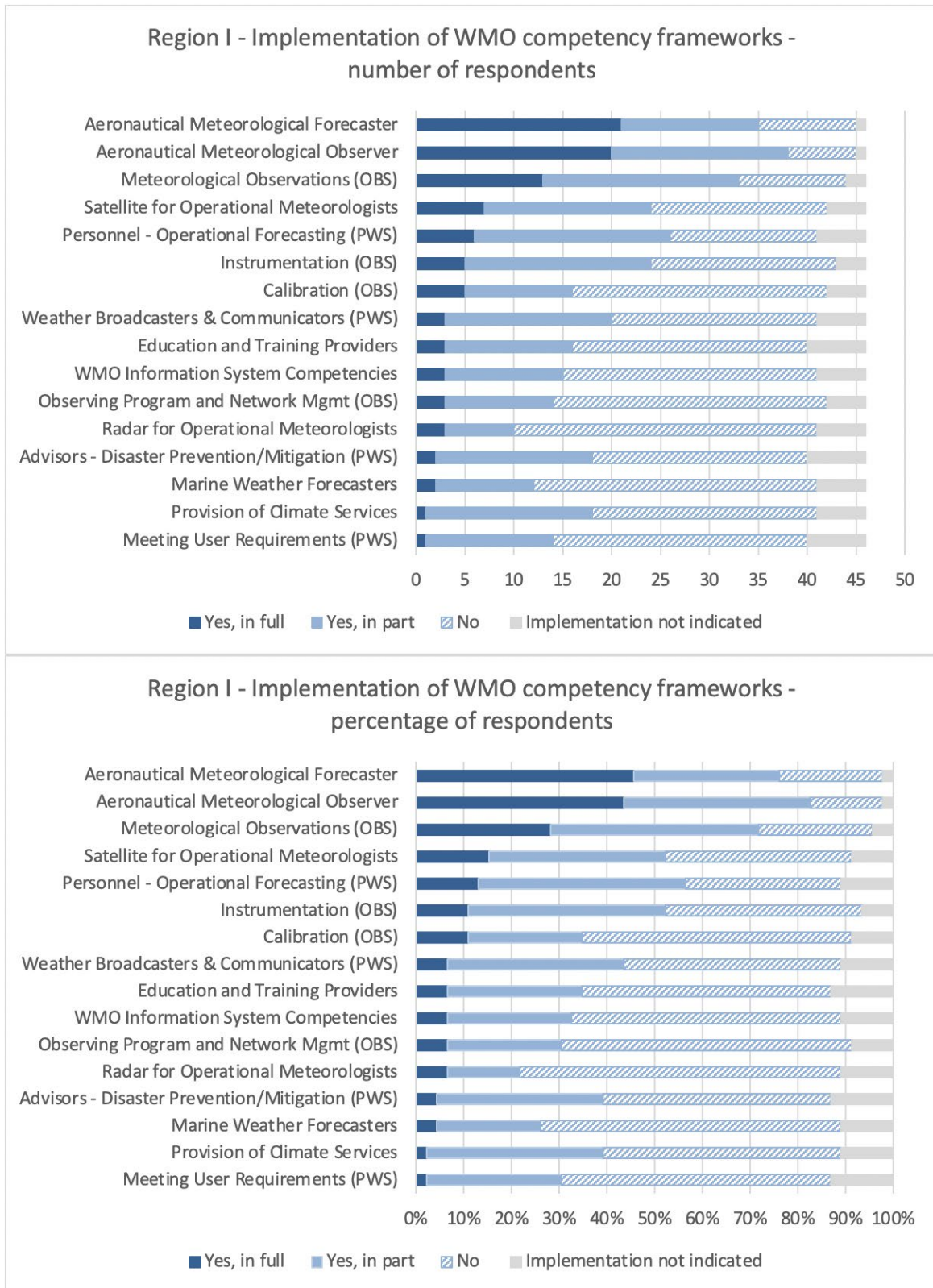
- Weather Broadcasters & Communicators (PWS)
- WMO Information System Competencies
- Marine Weather Forecasters

These four competency frameworks were assessed once every five years or more by 20% to 30% of the respondents' NMHSs.

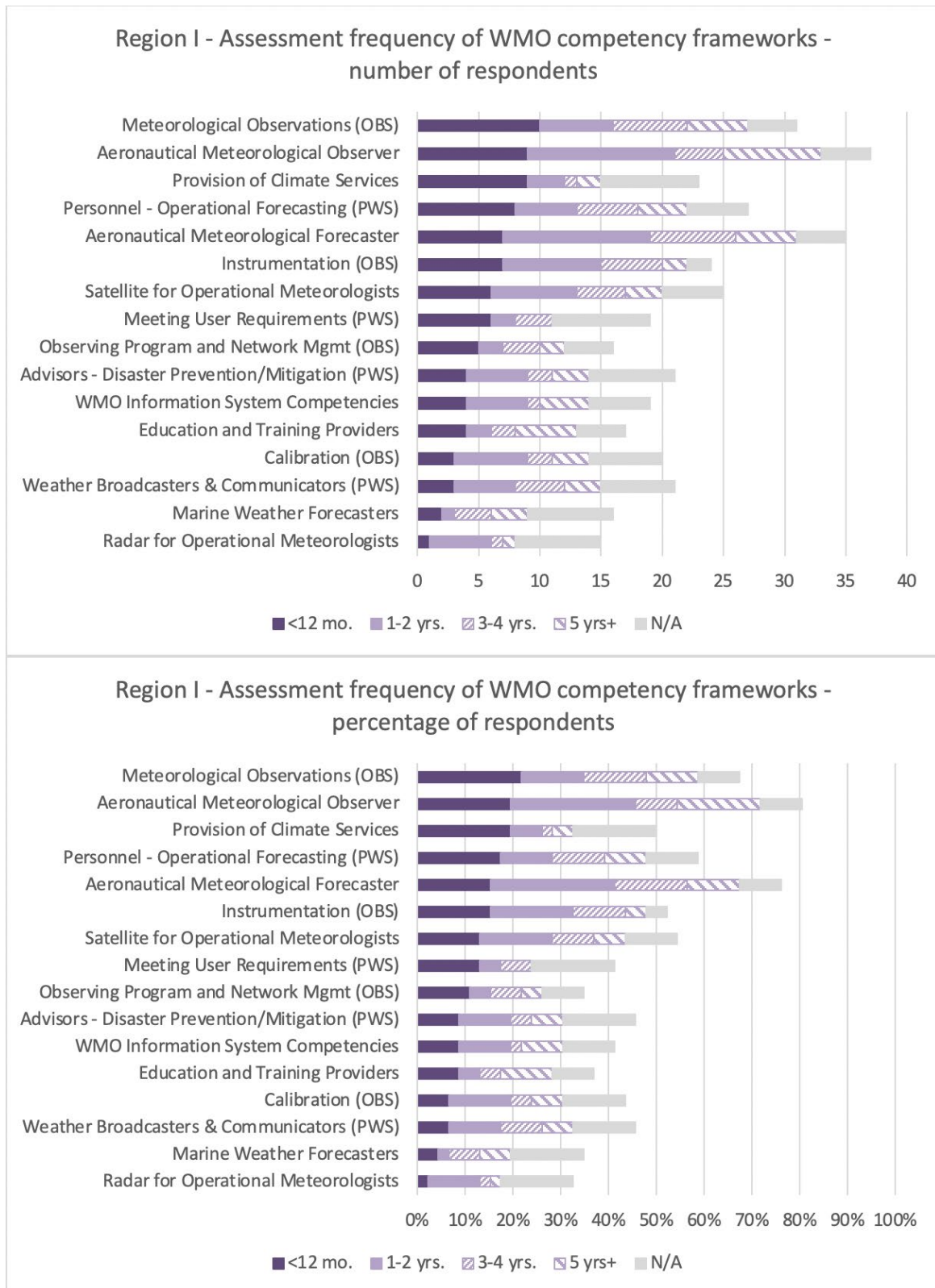
Eleven per cent to 15% of the respondents indicated that assessment of these four competency frameworks was not applicable to their NMHS.

#### 2.2.6.3 **Regional implementation rates and assessment frequencies**

Figures 66 through 77 show the implementation rates and assessment frequencies for the WMO competency frameworks for the respondents in each region.

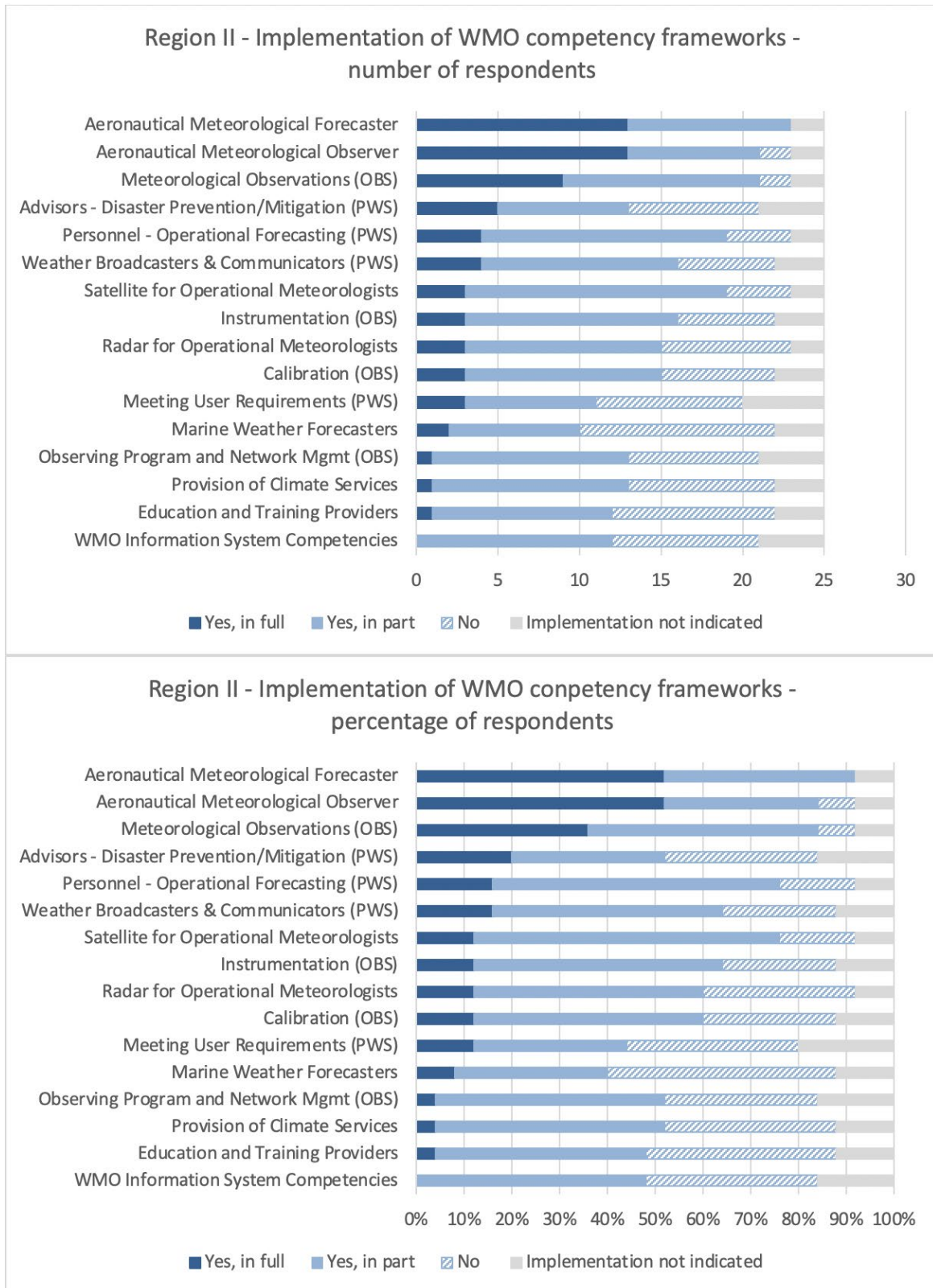


**Figure 66. Region I implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**

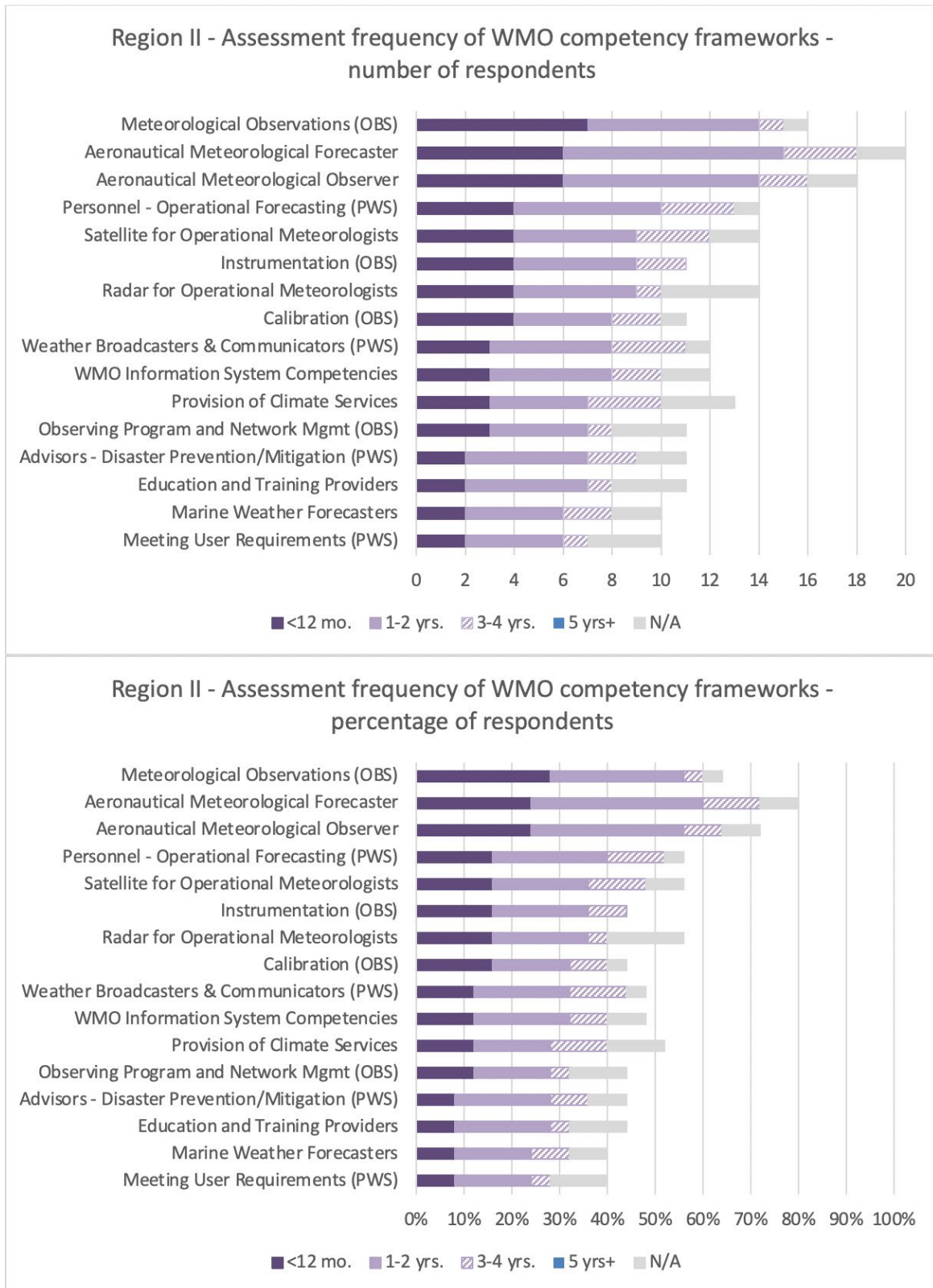


**Figure 67. Region I assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**

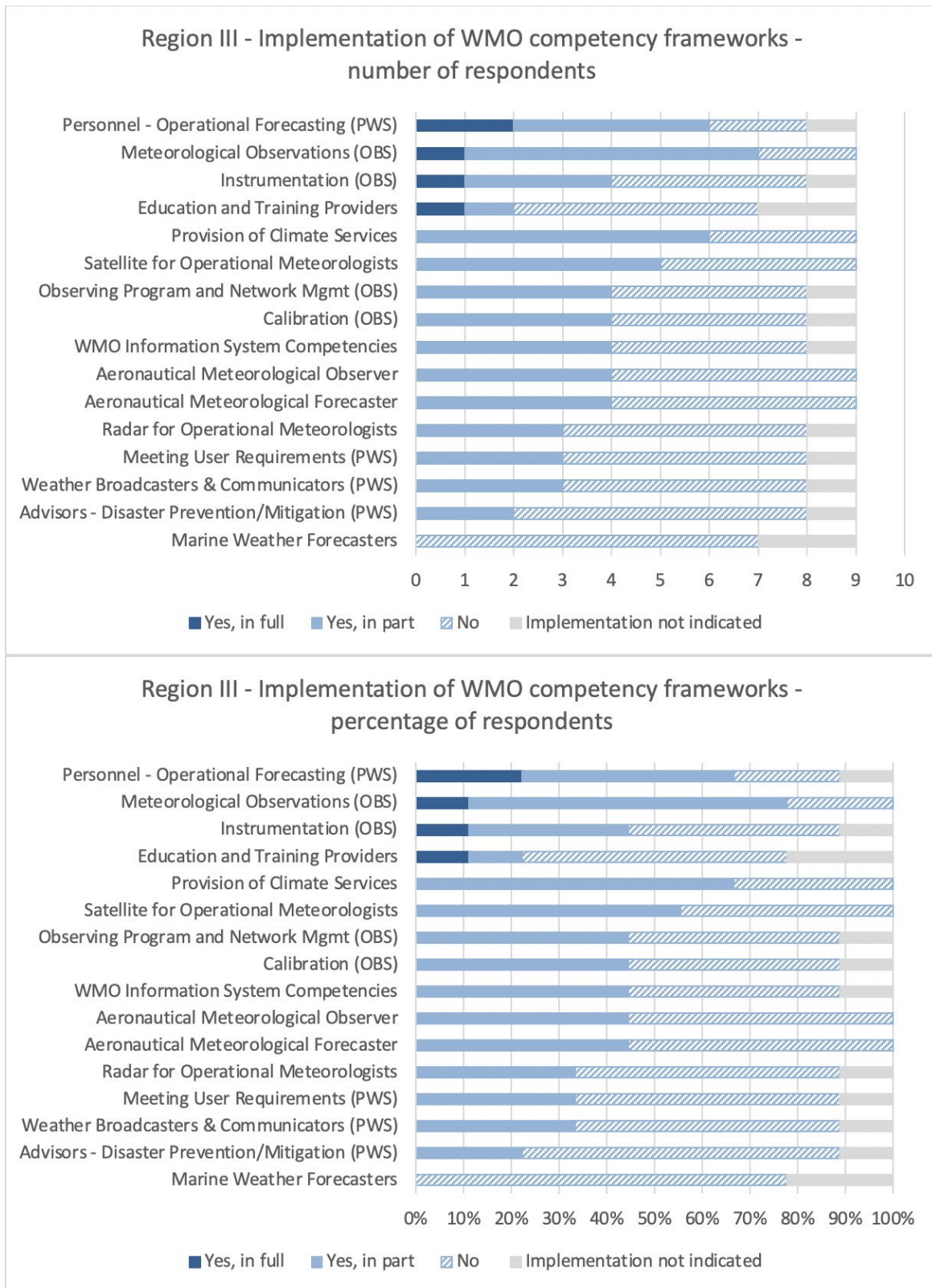




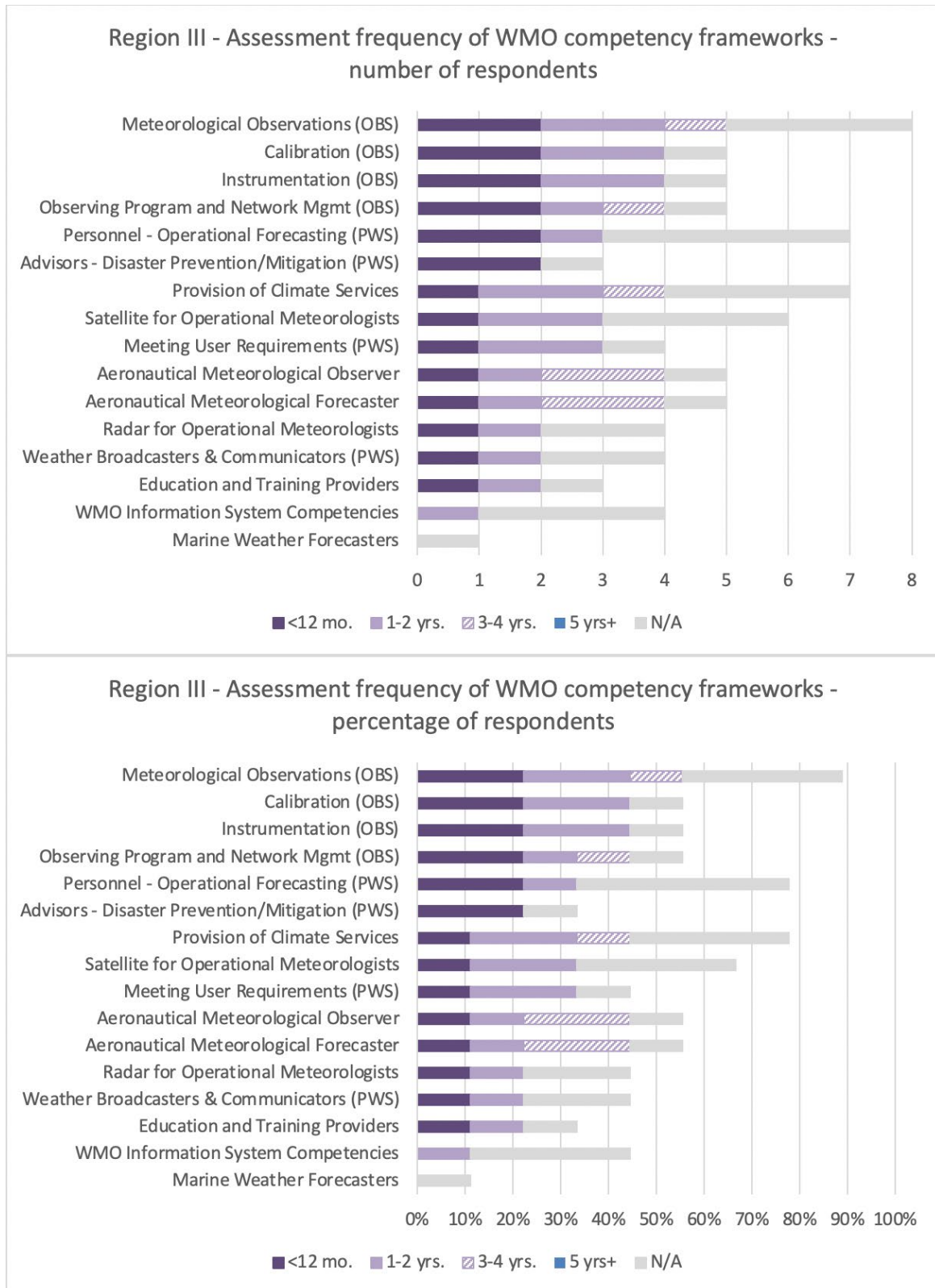
**Figure 68. Region II implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**



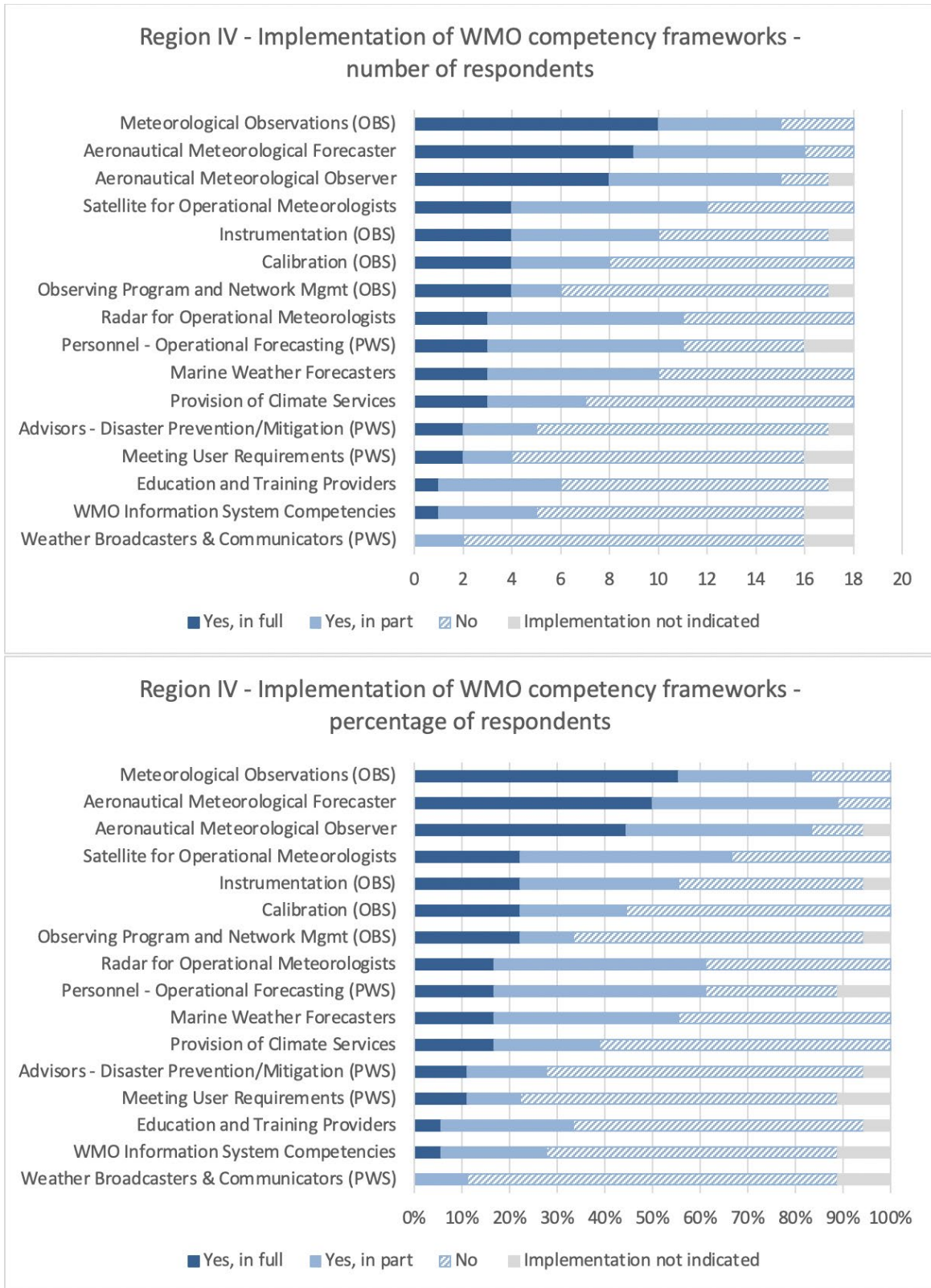
**Figure 69. Region II assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**



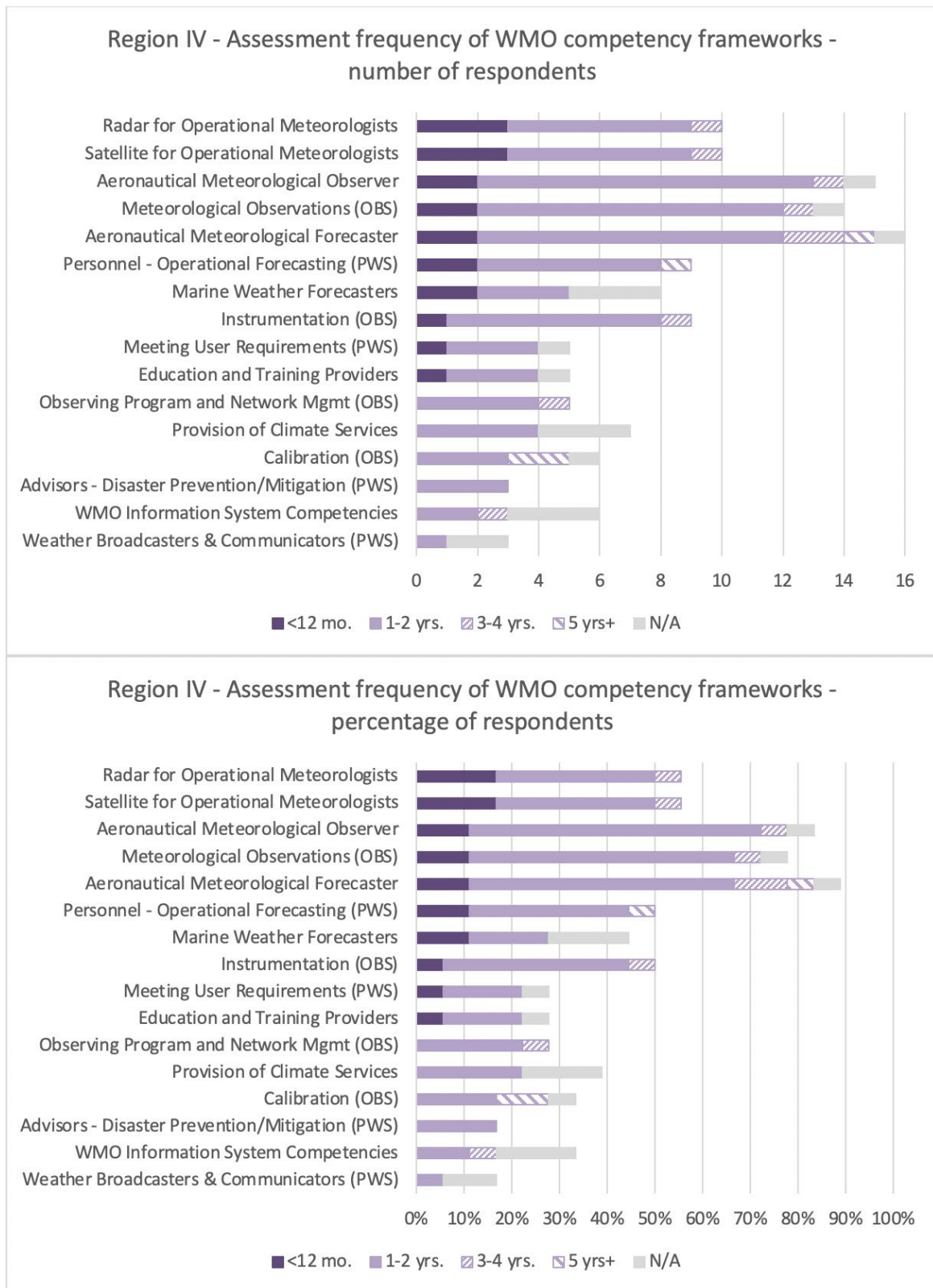
**Figure 70. Region III implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**



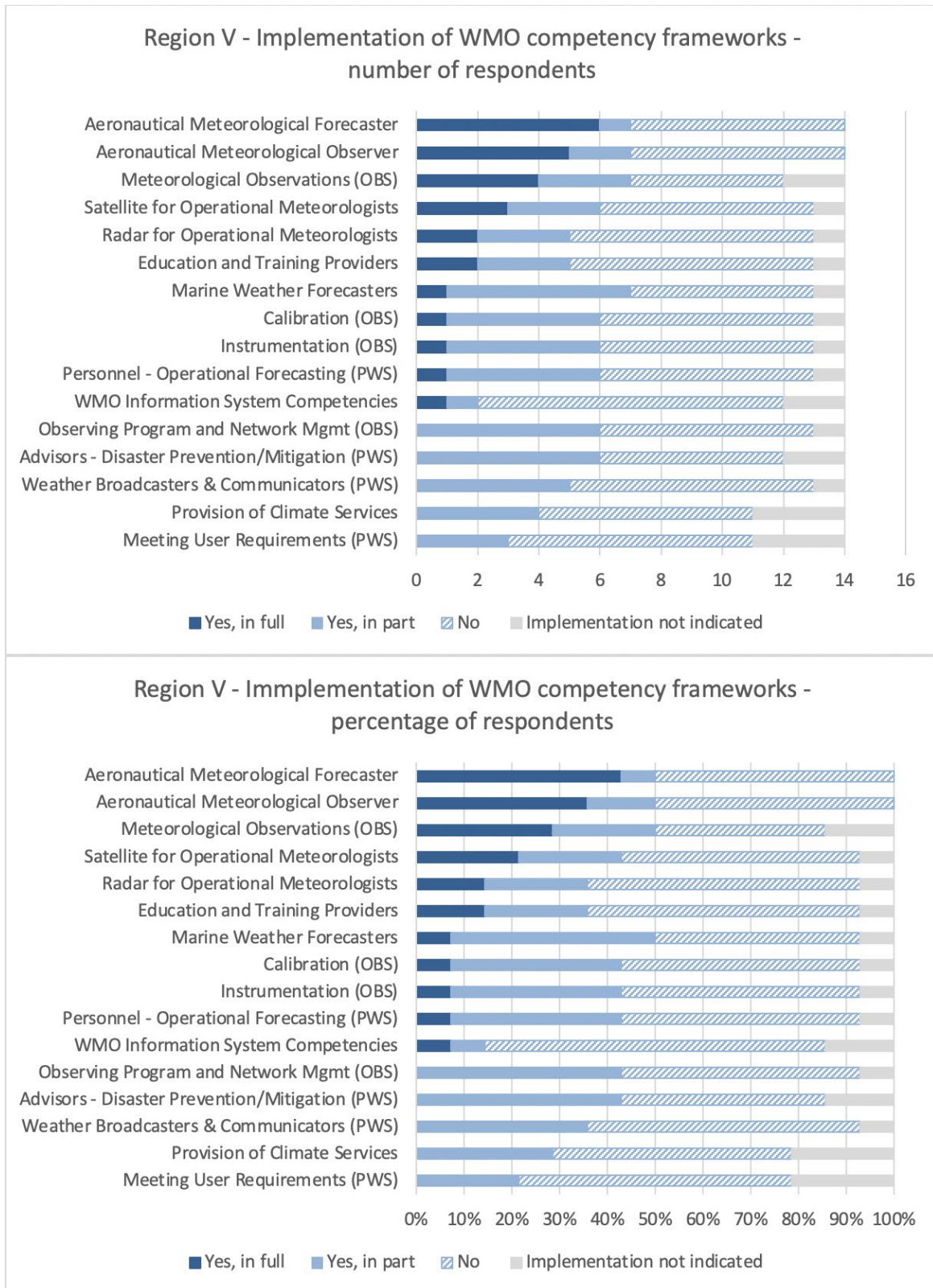
**Figure 71. Region III assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**



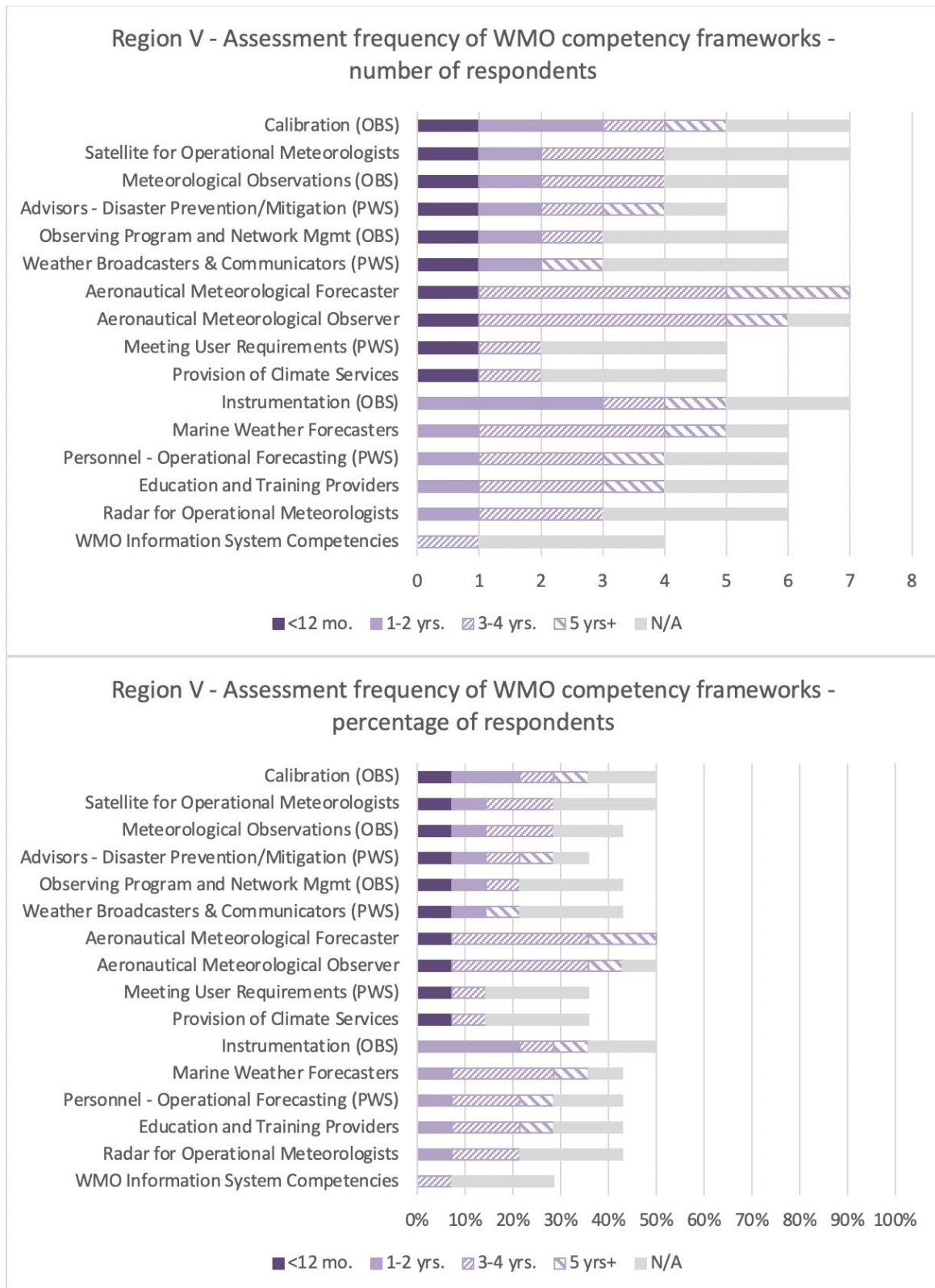
**Figure 72. Region IV implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**



**Figure 73. Region IV assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**

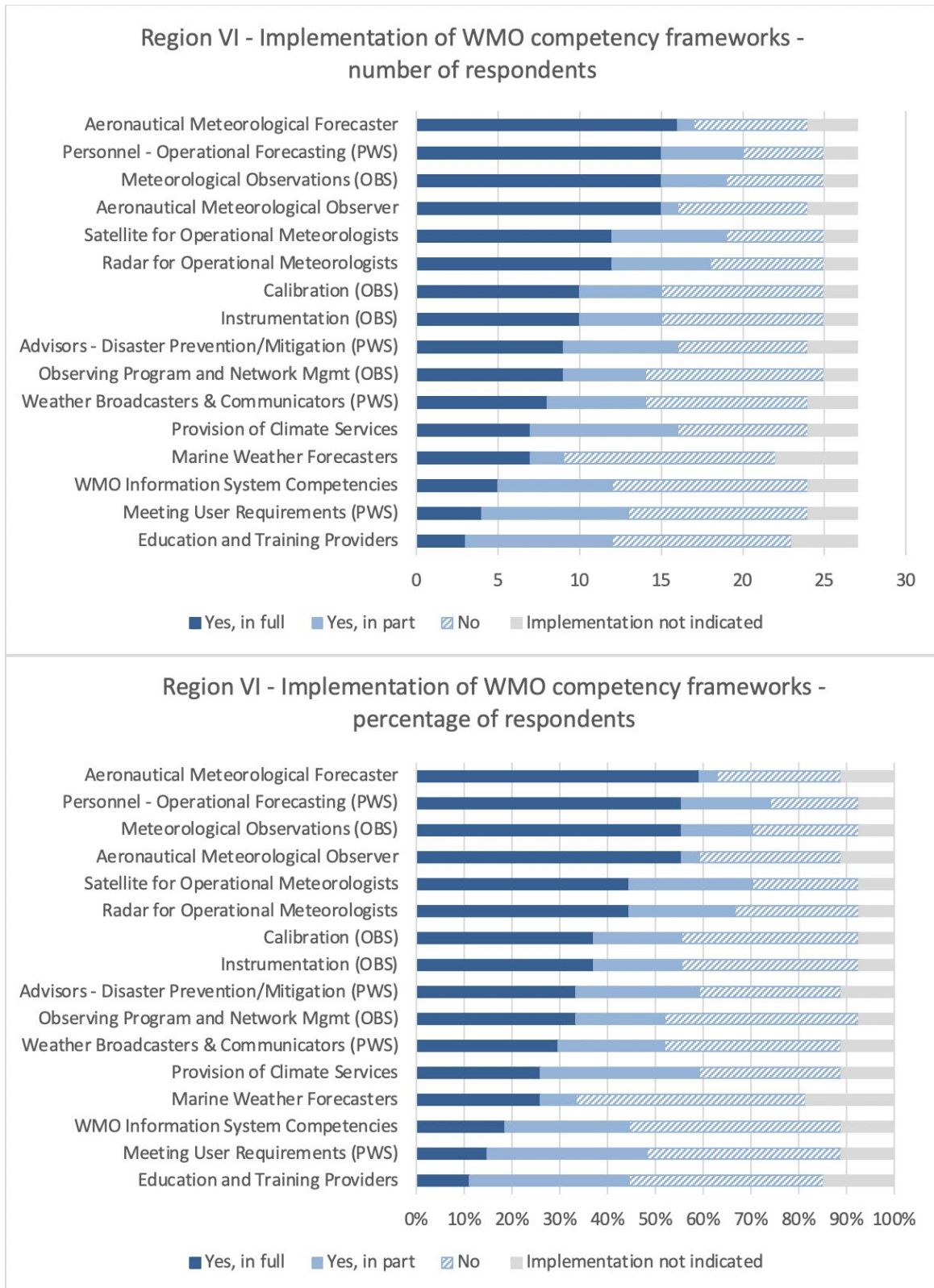


**Figure 74. Region V implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**

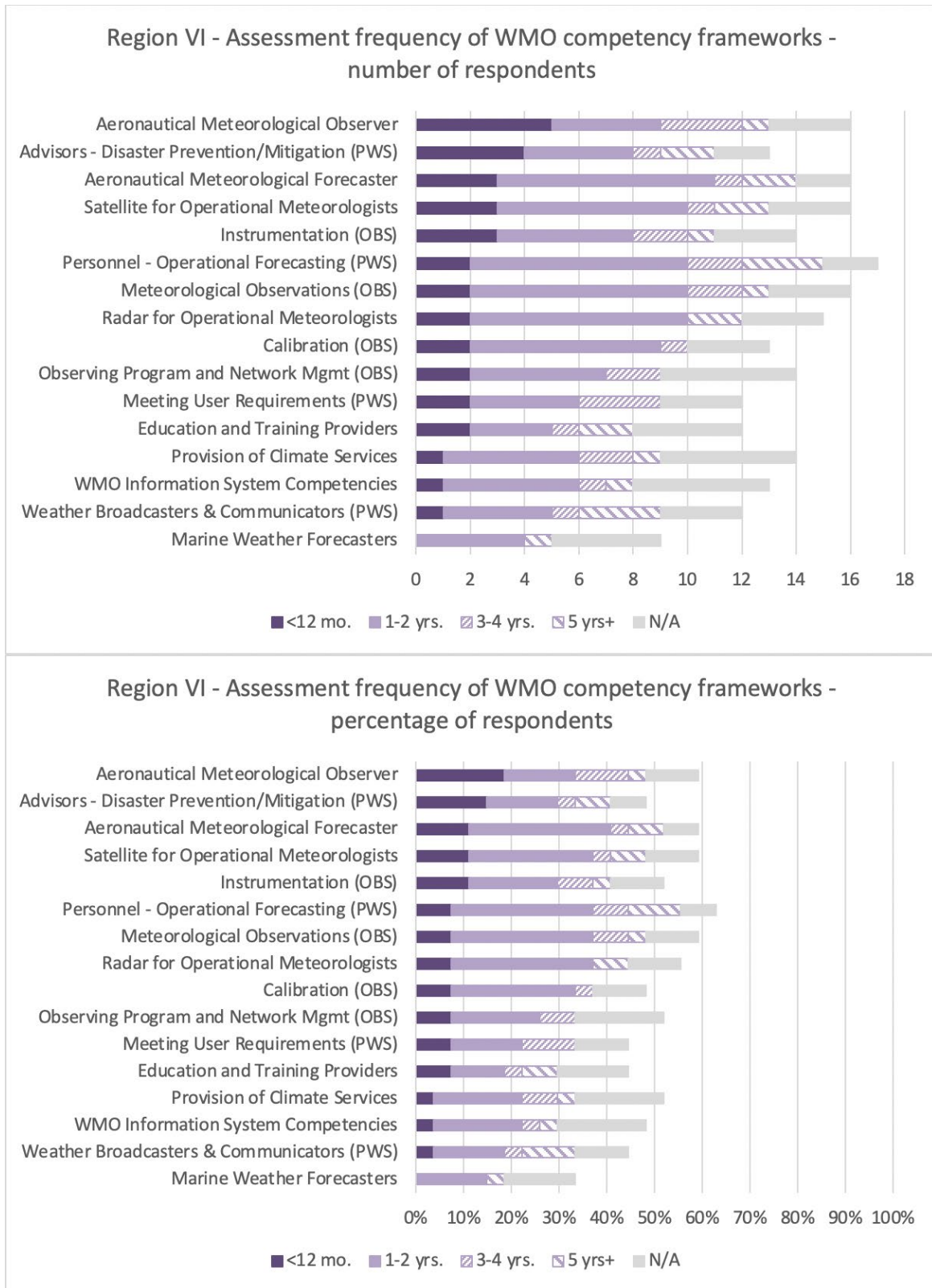


**Figure 75. Region V assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**





**Figure 76. Region VI implementation rates for the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by implementation in full, then by implementation in part**



**Figure 77. Region VI assessment frequencies of the WMO competency frameworks: number and percentage of respondents that indicated each implementation level, sorted by the assessment frequency of less than 12 months, then by the assessment frequency of every 1–2 years**

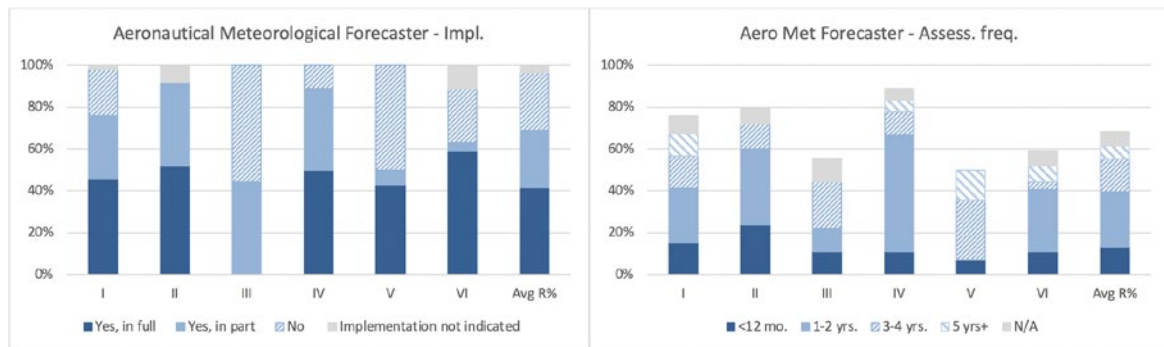
2.2.6.4 Implementation rate and assessment frequency by competency framework

Figures 78 through 93 show the implementation rates and assessment frequencies for each WMO competency framework.

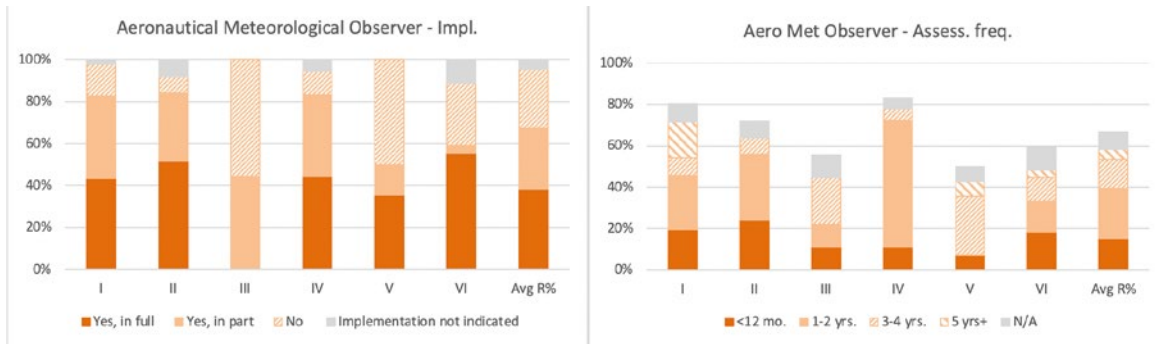
The figures are ordered with respect to the global percentage of NMHSs that had fully implemented each framework at the time of the survey according to the respondents, from the most to the least widely implemented framework. Table 64 lists the frameworks in the order in which they appear, along with the corresponding figure number.

**Table 64. Order of the competency framework figures in this section**

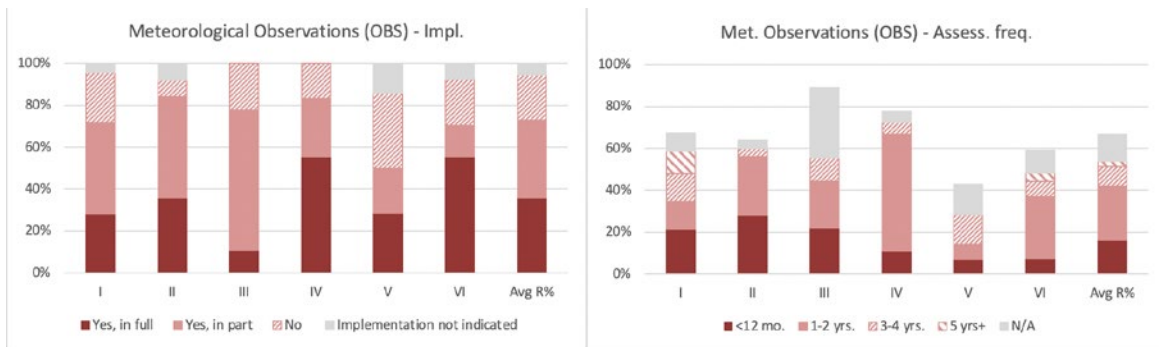
Competency framework	Figure number
1. Aeronautical Meteorological Forecaster	78
2. Aeronautical Meteorological Observer	79
3. Meteorological Observations (OBS)	80
4. Personnel – Operational Forecasting (PWS)	81
5. Satellite for Operational Meteorologists	82
6. Instrumentation (OBS)	83
7. Calibration (OBS)	84
8. Radar for Operational Meteorologists	85
9. Advisors – Disaster Prevention/Mitigation (PWS)	86
10. Observing Program and Network Mgmt (OBS)	87
11. Weather Broadcasters & Communicators (PWS)	88
12. Marine Weather Forecasters	89
13. Provision of Climate Services	90
14. Education and Training Providers	91
15. WMO Information System Competencies	92
16. Meeting User Requirements (PWS)	93



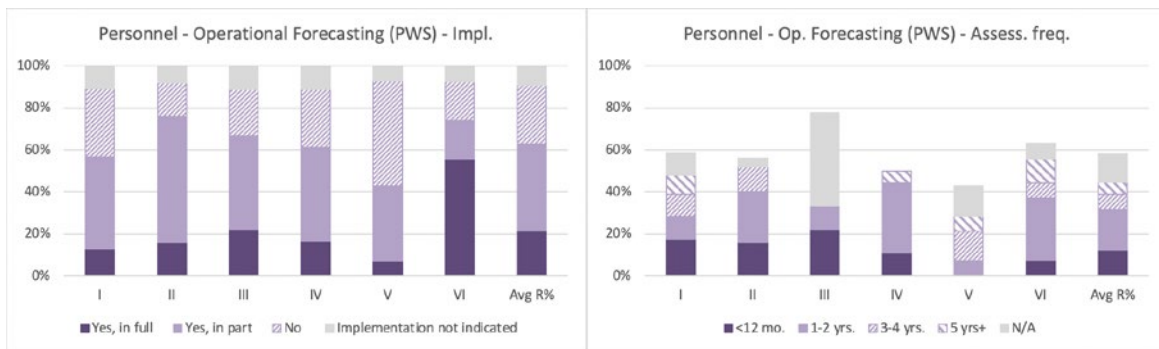
**Figure 78. Implementation rates and assessment frequencies for the Aeronautical Meteorological Forecaster competency framework**



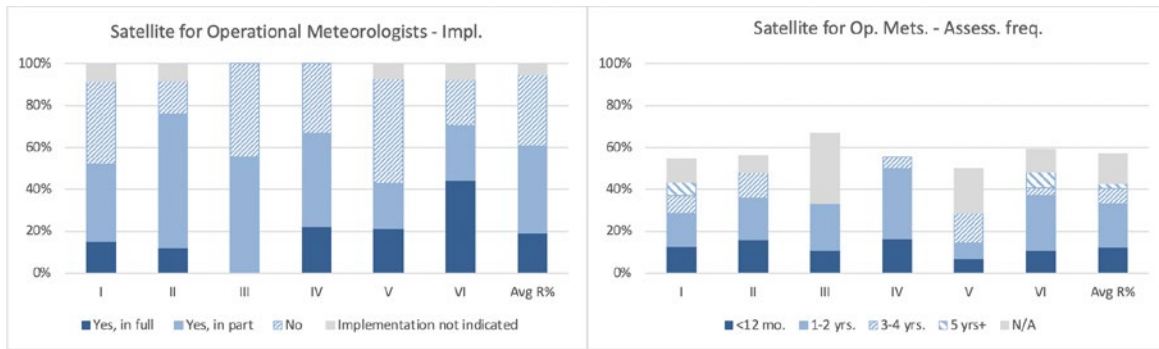
**Figure 79. Implementation rates and assessment frequencies for the Aeronautical Meteorological Observer competency framework**



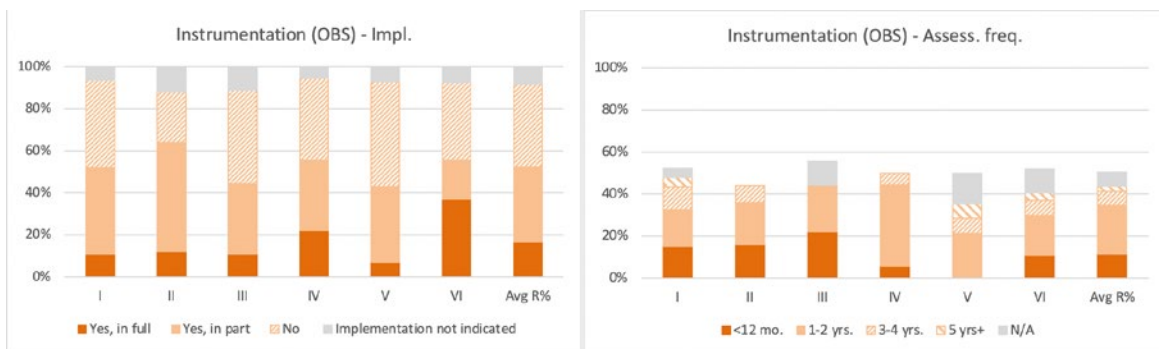
**Figure 80. Implementation rates and assessment frequencies for the Meteorological Observations (OBS) competency framework**



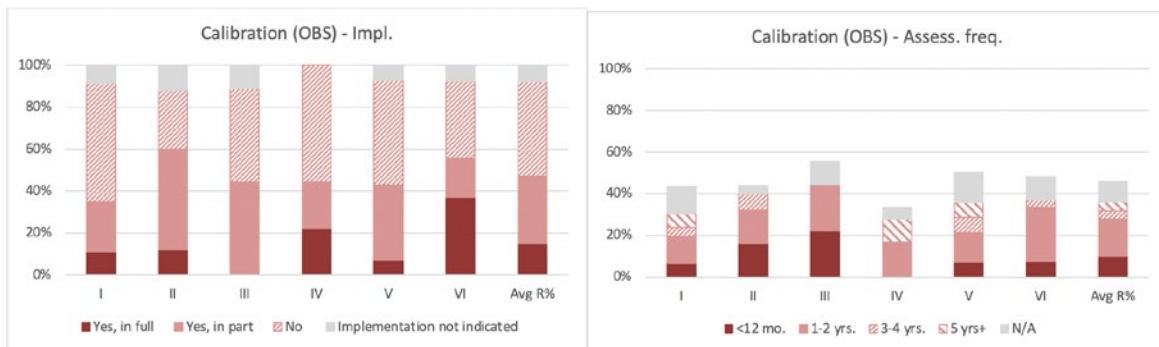
**Figure 81. Implementation rates and assessment frequencies for the Personnel – Operational Forecasting (PWS) competency framework**



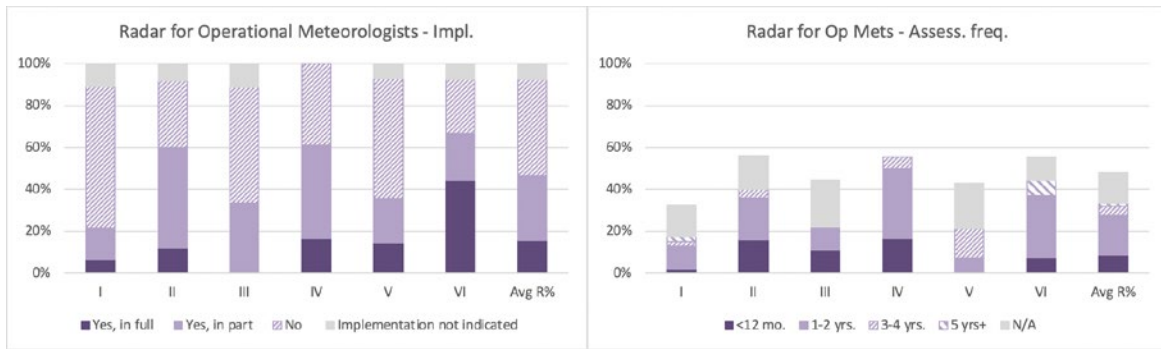
**Figure 82. Implementation rates and assessment frequencies for the Satellite for Operational Meteorologists competency framework**



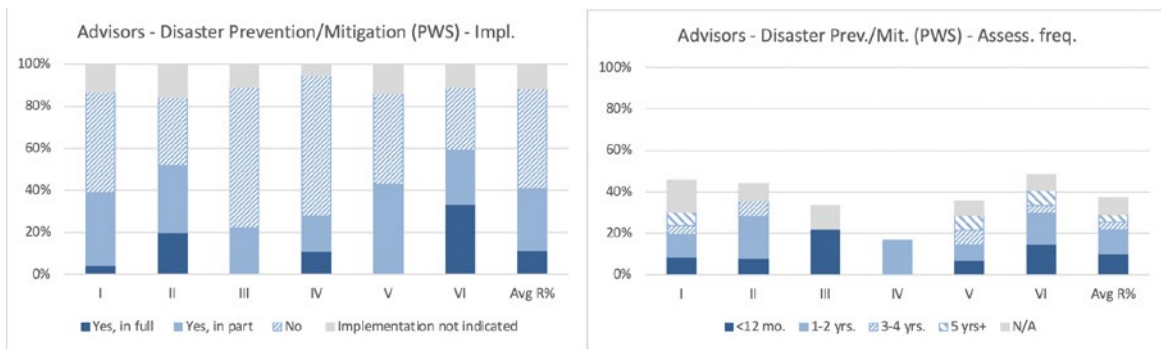
**Figure 83. Implementation rates and assessment frequencies for the Instrumentation (OBS) competency framework**



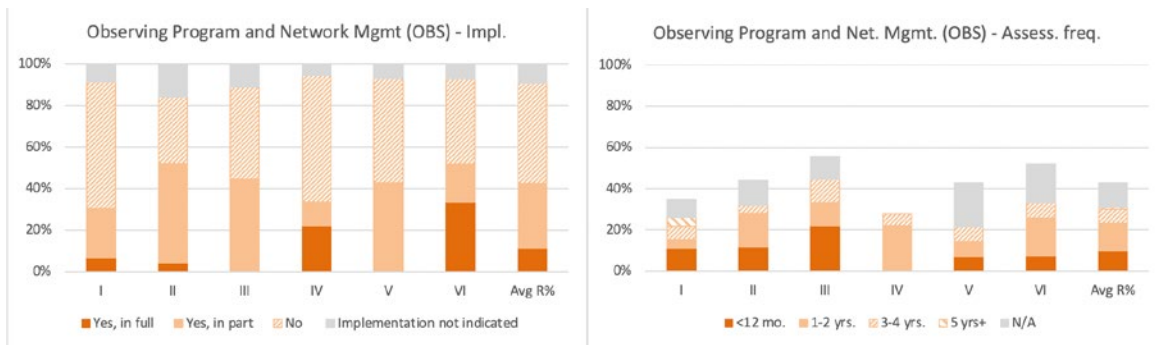
**Figure 84. Implementation rates and assessment frequencies for the Calibration (OBS) competency framework**



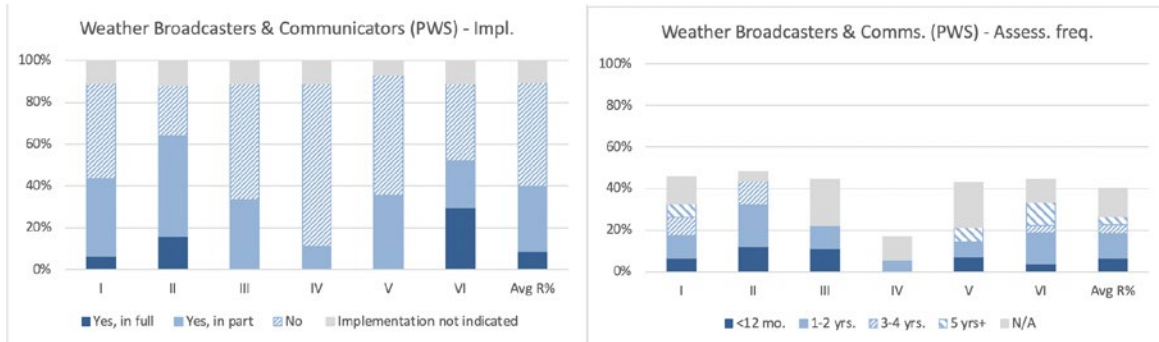
**Figure 85. Implementation rates and assessment frequencies for the Radar for Operational Meteorologists competency framework**



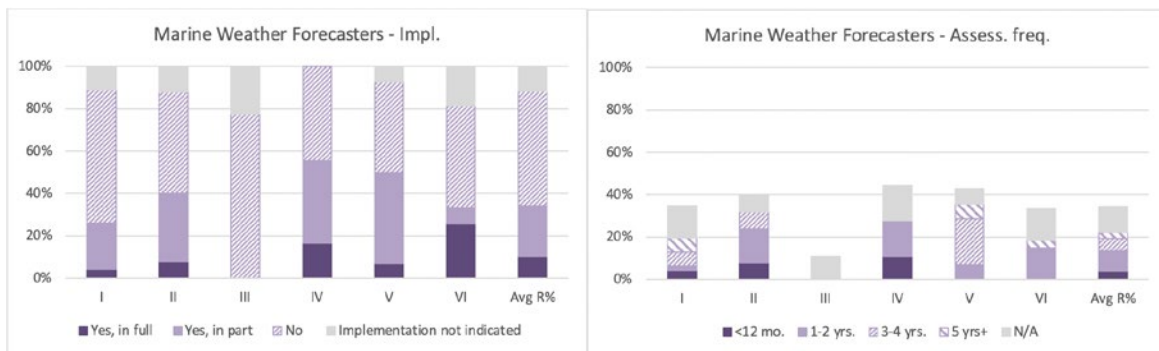
**Figure 86. Implementation rates and assessment frequencies for the Advisors – Disaster Prevention/Mitigation (PWS) competency framework**



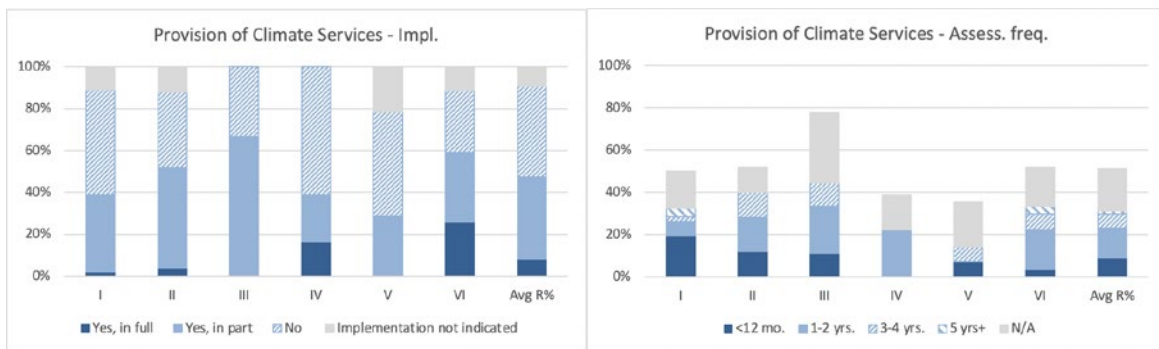
**Figure 87. Implementation rates and assessment frequencies for the Observing Program and Network Management (OBS) competency framework**



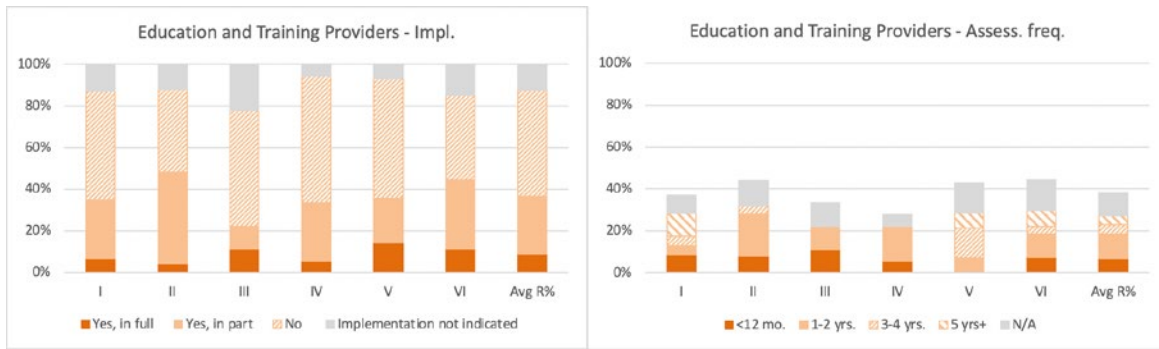
**Figure 88. Implementation rates and assessment frequencies for the Weather Broadcasters & Communicators (PWS) competency framework**



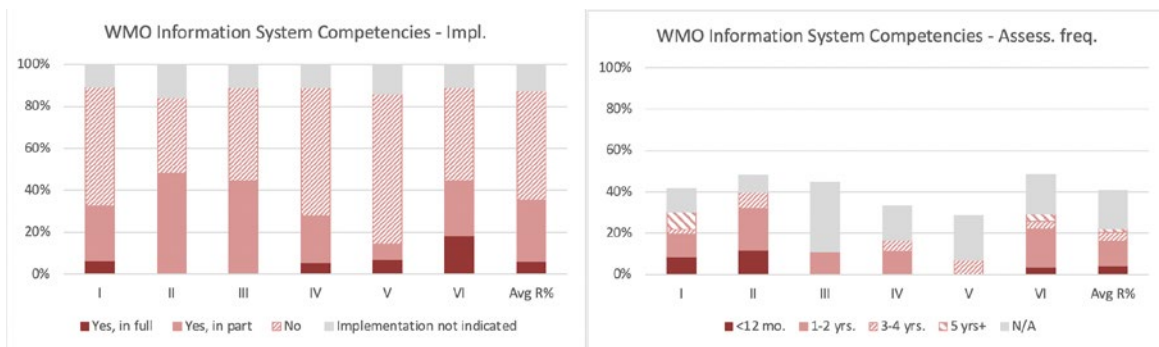
**Figure 89. Implementation rates and assessment frequencies for the Marine Weather Forecasters competency framework**



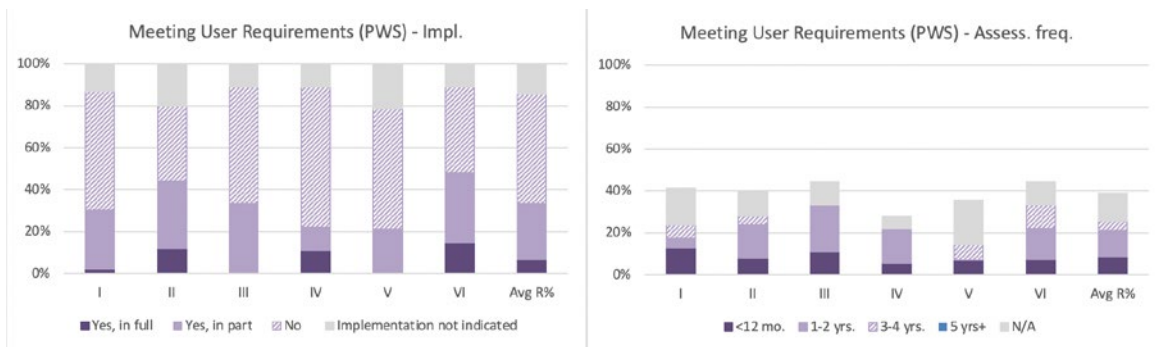
**Figure 90. Implementation rates and assessment frequencies for the Provision of Climate Services competency framework**



**Figure 91. Implementation rates and assessment frequencies for the Education and Training Providers competency framework**



**Figure 92. Implementation rates and assessment frequencies for the WMO Information System competency framework**



**Figure 93. Implementation rates and assessment frequencies for the Meeting User Requirements competency framework**



## APPENDIX A. SURVEY FORM



WORLD  
METEOROLOGICAL  
ORGANIZATION  
Weather - Climate - Water

### STAFF, COMPETENCIES AND QUALIFICATIONS

---

#### Initial Information

**Name of Member/Country: \***

Choose...

**Your Name: \***

**Your Email Address: \***

Start

For reference only!  
Please submit the [online survey here!](#)

## 1.1 STAFFING

**1. Number of staff by gender**

How many men and women work in your National Meteorological and Hydrological Service (NMHS)?

Female	<input type="text"/>
Male	<input type="text"/>

**2. Number of staff by professional category**

How many staff work in the following roles?

	Male	Female
Manager	<input type="text"/>	<input type="text"/>
Meteorologist	<input type="text"/>	<input type="text"/>
Meteorological Technician	<input type="text"/>	<input type="text"/>
Hydrologist	<input type="text"/>	<input type="text"/>
Hydrological Technician	<input type="text"/>	<input type="text"/>
Climatologist/Climate Services	<input type="text"/>	<input type="text"/>
Researcher	<input type="text"/>	<input type="text"/>
Support Staff	<input type="text"/>	<input type="text"/>
Customer Interactions and Communications (such as DRR)	<input type="text"/>	<input type="text"/>
Social scientist	<input type="text"/>	<input type="text"/>
Lawyer	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>
Total Staff	0	0

*Note that the total number of staff in for each gender should match the number you provided in your answer to Question 1.*

**3. Number of staff with university degree.**

Please provide the number of staff with university degree:

Male	<input type="text"/>
Female	<input type="text"/>

**4. Number of staff, by age category.**

How many of your NMHS staff are in the following age categories?

Less than 20 years old	<input type="text"/>
21 - 30 years old	<input type="text"/>
31 - 40 years old	<input type="text"/>
41 - 50 years old	<input type="text"/>
over 50 years old	<input type="text"/>

**5. Staffing trend in the last 3-5 years.**

Please indicate the trend of the staffing figures during the recent 3-5 years:

- Steadily increasing  
 Steadily decreasing  
 No significant year-to-year change

## 1.2 CAPACITY DEVELOPMENT

**6. Number of staff in need of training, by professional category.**

How many people in these job categories and at what priority level?

		Priority
Manager	<input type="text"/>	Choose...
Meteorologist	<input type="text"/>	Choose...
Meteorological Technician	<input type="text"/>	Choose...
Hydrologist	<input type="text"/>	Choose...
Climatologist/ Climate Services	<input type="text"/>	Choose...
Researcher	<input type="text"/>	Choose...
Support Staff	<input type="text"/>	Choose...
Customer Interactions and Communications (such as DRR)	<input type="text"/>	Choose...

**7. Number of experts expected to be trained**

How many staff are expected to be trained in 2021 for longer than one week, through the support of these various sources?

Government	<input type="text"/>
Project funds	<input type="text"/>
WMO	<input type="text"/>
Other scholarships	<input type="text"/>

**8. Indicate the level of priority for WMO support on the following types of fellowships:**

	Priority
Short course	Choose...
BSc Programme	Choose...
MSc Programme	Choose...
PhD Programme	Choose...

**9. Areas in which NMHS staff training is needed.**

Please list in order of priority the 4 areas where your NMHS staff need training:

	Area
Priority 1	<input type="text" value="Choose..."/>
Priority 2	<input type="text" value="Choose..."/>
Priority 3	<input type="text" value="Choose..."/>
Priority 4	<input type="text" value="Choose..."/>

**10. Completion of BIP-M by personnel engaged in service provision.**

Basic Instruction Package for Meteorological Technicians (BIP-MT)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No
Basic Instruction Package for Meteorologists (BIP-M)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No
Basic Instruction Package for Hydrological Technicians (BIP-HT)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No
Basic Instruction Package for Hydrologists (BIP-H)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No

**11. Training and assessment of personnel on WMO competency frameworks: status of implementation and frequency of assessment.**

Does your NMHS (or other service provider responsible for the provision of meteorological, hydrological and climate services) implement training and assessment for personnel on the following WMO competency frameworks?

	Status of implementation	If yes in full or in part, what is the frequency of the competency
Aeronautical Meteorological Forecaster	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Aeronautical Meteorological Observer	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Competencies for Provision of Climate Services	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Marine Weather Forecasters	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
WMO Information System Competencies	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Education and Training Providers	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Personnel Engaged in Operational Forecasting (PWS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Weather Broadcasters and Communicators (PWS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Advisors Supporting Disaster Prevention and Mitigation and Other User Activities (PWS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Competency Requirements for Persons Engaged in the Development and Delivery of Products and Services to Meet User Requirements (PWS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Meteorological Observations (OBS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Competency Framework for Instrumentation (OBS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Competency Framework for Calibration (OBS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Competency Framework for Observing Program and Network Management (OBS)	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Satellite Skills and Knowledge for Operational Meteorologists	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>
Radar Skills and Knowledge for Operational Meteorologists	<input type="radio"/> Yes, in full <input type="radio"/> Yes, in part <input type="radio"/> No	<input type="text" value="Choose..."/>

\* Note that information about the WMO competency frameworks is provided in the Compendium of [WMO Competency Frameworks \(WMO-No. 1209\)](#) and guidelines on the implementation of competency-based training and assessment are provided in the [Guide to Competency \(WMO-No. 1205\)](#)

[Previous](#)

[Complete](#)

## APPENDIX B. LIST OF RESPONDENTS

Table 64. Members that responded to the WMO 2021 Survey on the Status of Human Resources in National Meteorological and Hydrological Services: Staff, Competencies and Qualifications

<b>Region I – Africa</b>			
1	Angola	24	Malawi
2	Benin	25	Mali
3	Botswana	26	Mauritania
4	Burkina Faso	27	Mauritius
5	Burundi	28	Morocco
6	Cabo Verde	29	Mozambique
7	Cameroon	30	Namibia
8	Comoros	31	Niger
9	Congo	32	Nigeria
10	Côte d'Ivoire	33	Rwanda
11	Democratic Republic of the Congo	34	Sao Tome and Principe
12	Djibouti	35	Senegal
13	Egypt	36	Seychelles
14	Ethiopia	37	Sierra Leone
15	Gabon	38	South Africa
16	Gambia	39	South Sudan
17	Ghana	40	Sudan
18	Guinea	41	Togo
19	Guinea-Bissau	42	Tunisia
20	Kenya	43	Uganda
21	Lesotho	44	United Republic of Tanzania
22	Libya (State of)	45	Zambia
23	Madagascar	46	Zimbabwe

<b>Region II – Asia</b>			
1	Afghanistan	14	Nepal
2	Bahrain	15	Oman
3	Bhutan	16	Pakistan
4	China	17	Qatar
5	Hong Kong, China	18	Republic of Korea
6	India	19	Saudi Arabia
7	Iran, Islamic Republic of	20	Sri Lanka
8	Iraq	21	Tajikistan
9	Japan	22	Thailand
10	Kuwait	23	Turkmenistan
11	Lao People's Democratic Republic	24	United Arab Emirates
12	Macao, China	25	Yemen
13	Maldives		

<b>Region III – South America</b>			
1	Argentina	6	Paraguay
2	Brazil	7	Peru
3	Chile	8	Uruguay
4	Colombia	9	Venezuela, Bolivarian Republic of
5	Ecuador		

<b>Region IV – North America, Central America and the Caribbean</b>			
1	Antigua and Barbuda	10	Dominican Republic
2	Bahamas	11	El Salvador
3	Barbados	12	Haiti
4	Belize	13	Jamaica
5	British Caribbean Territories	14	Mexico
6	Canada	15	Panama
7	Costa Rica	16	Saint Lucia
8	Curaçao and Sint Maarten	17	Trinidad and Tobago
9	Dominica	18	United States of America

<b>Region V – South-West Pacific</b>			
1	Australia	8	New Zealand
2	Cook Islands	9	Papua New Guinea
3	Fiji	10	Samoa
4	Indonesia	11	Singapore
5	Malaysia	12	Solomon Islands
6	Micronesia, Federated States of	13	Timor-Leste
7	Nauru	14	Vanuatu

<b>Region VI – Europe</b>			
1	Armenia	15	Italy
2	Azerbaijan	16	Lebanon
3	Belgium	17	Netherlands
4	Bosnia and Herzegovina	18	North Macedonia
5	Croatia	19	Republic of Moldova
6	Denmark	20	Romania
7	Estonia	21	Serbia
8	Finland	22	Slovakia
9	France	23	Slovenia
10	Georgia	24	Spain
11	Germany	25	Sweden
12	Hungary	26	Switzerland
13	Ireland	27	United Kingdom of Great Britain and Northern Ireland
14	Israel		

---

For more information, please contact:

**World Meteorological Organization**

7 bis, avenue de la Paix – P.O. Box 2300 – CH 1211 Geneva 2 – Switzerland

**Strategic Communications Office**

Tel.: +41 (0) 22 730 83 14 – Fax: +41 (0) 22 730 80 27

Email: [cpa@wmo.int](mailto:cpa@wmo.int)

[public.wmo.int](http://public.wmo.int)