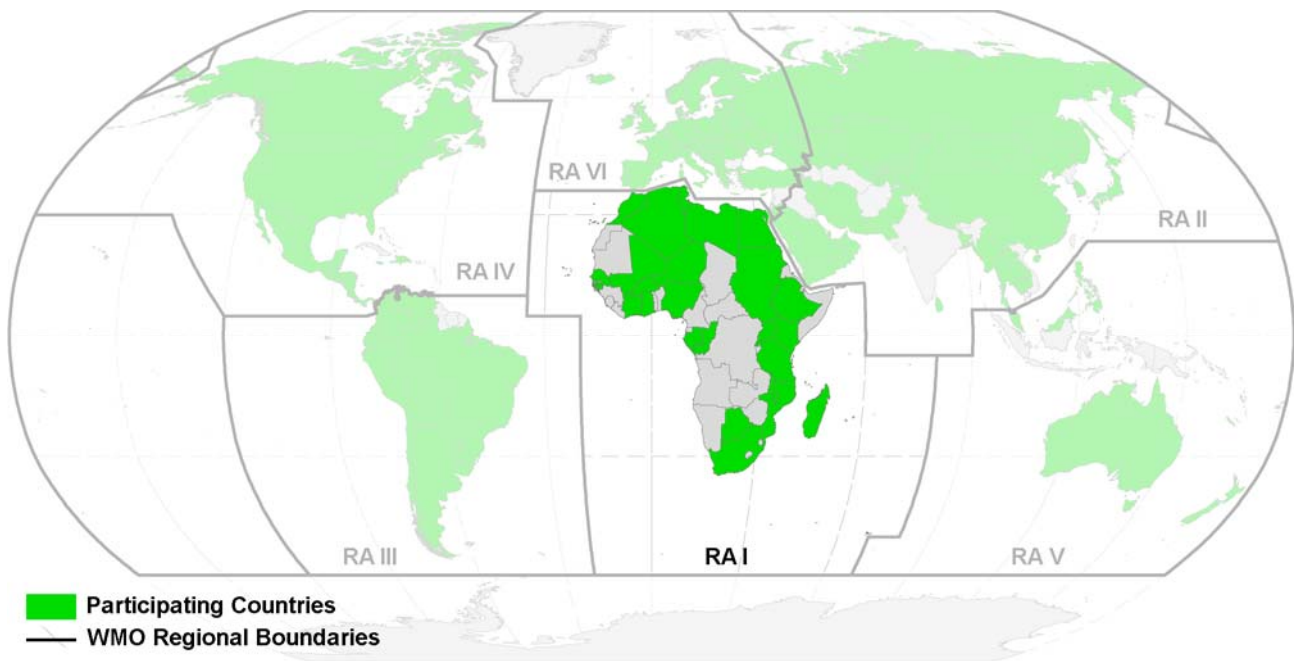


# CHAPTER 4



## AFRICA

### WMO REGIONAL ASSOCIATION I



## 4 AFRICA (WMO Regional Association I)

### 4.1 Abstract

Survey responses from 28 African National Meteorological and Hydrological Services (NMHSs) indicate that there are widespread deficiencies in hydrometeorological observing networks, telecommunications and informatics systems in Africa and very limited NMHS capacities in data management and product customization. NMHSs' hazard warning capacities are uneven, even non-existent in some countries, while warning programmes often do not address all significant meteorological and hydrological hazards. Fewer than half of African NMHSs have emergency contingency plans. These weaknesses are often compounded by poor operational coordination between National Meteorological Services (NMSs) and National Hydrological Services (NHSs) and with Regional Specialized Meteorological Centers (RSMCs) and neighbouring NMHSs, and by inadequate linkages with other stakeholders. Needs are widely expressed for expansion of public and stakeholder outreach programmes and for joint training with disaster authorities. Inadequate financial and maintenance resources and shortages of trained professional staff also affect virtually all African NMHSs. Moreover, a significant minority suggest that their national coordinating structures for disaster risk reduction need to be improved, with many feeling constrained by a lack of clarity regarding their roles. The preceding deficiencies are most strongly evident in the Least Developed African Countries. These survey results underpin the following conclusions and recommendations aimed at enhancing the contributions of African NMHSs to disaster risk reduction:

- All African NMHSs should be integrated into their national disaster risk reduction systems and, if not already members, should seek membership in their national coordinating committees for disaster risk management. All of them should press for clear direction regarding their roles and responsibilities and also pursue strengthened partnerships with other involved agencies and organizations.
- Most African NMHSs need to improve their archiving systems for hazard and impact data. This generates associated requirements for capacity development related to data rescue, quality assurance and data management and archiving.
- Most African NMHSs require capacity development and training in disaster risk applications such as hazard and impact analysis, hazard mapping, risk zone analysis and product customization.
- Every effort should be made to establish and maintain adequate hydrometeorological observation and telecommunications networks across Africa. Priority should be given to the very weak infrastructures and capacities of Least Developed (LDCs) and Developing Countries (DCs) and Small Island Developing States (SIDS).
- African NMHSs' hazard warning capacities need to be strengthened, particularly those in DCs, LDCs and SIDS. Warning programmes should be expanded to address all hydrometeorological hazards with disaster-causing potential and warnings routed to all important stakeholders.
- Official warnings of hydrometeorological hazards should emanate from a single competent issuing authority, ideally the NMHS. In some circumstances, however, they may benefit from assessment and interpretation by civil defence authorities before being widely disseminated.
- Verification programmes for hydrometeorological hazard warnings should be implemented by all African NMHSs to monitor warning accuracy and timeliness, assess improvements in skill, and demonstrate NMHSs' warning capabilities to stakeholders.
- Those African NMHSs who have not already done so should establish contingency arrangements to maintain hazard warnings and other services in emergency situations, perhaps through partnership agreements with neighbouring NMHS.
- NMHSs should encourage the establishment of national readiness systems within their countries.
- Operational coordination between African NMSs and NHSs and with neighbouring NMHSs and RSMCs should be improved. In some countries, this may require policy direction or partnership

agreements between the NMSs and NHSs to clarify their respective responsibilities in disaster risk reduction, particularly in relation to issue of early warnings.

- Most African NMHSs should increase emphasis on the provision of products and services to sensitive economic sectors such as land-use planning, housing and development and water resources. This will contribute significantly to disaster risk reduction.
- Most African NMHSs should increase emphasis on education and outreach directed at key stakeholders and the public at large.
- Many African NMHSs indicated the need for support from WMO in capacity building, infrastructure development and resource mobilization. Capacity development is particularly needed in hazard mapping, inputs to risk assessment tools and the development of national disaster risk reduction plans.

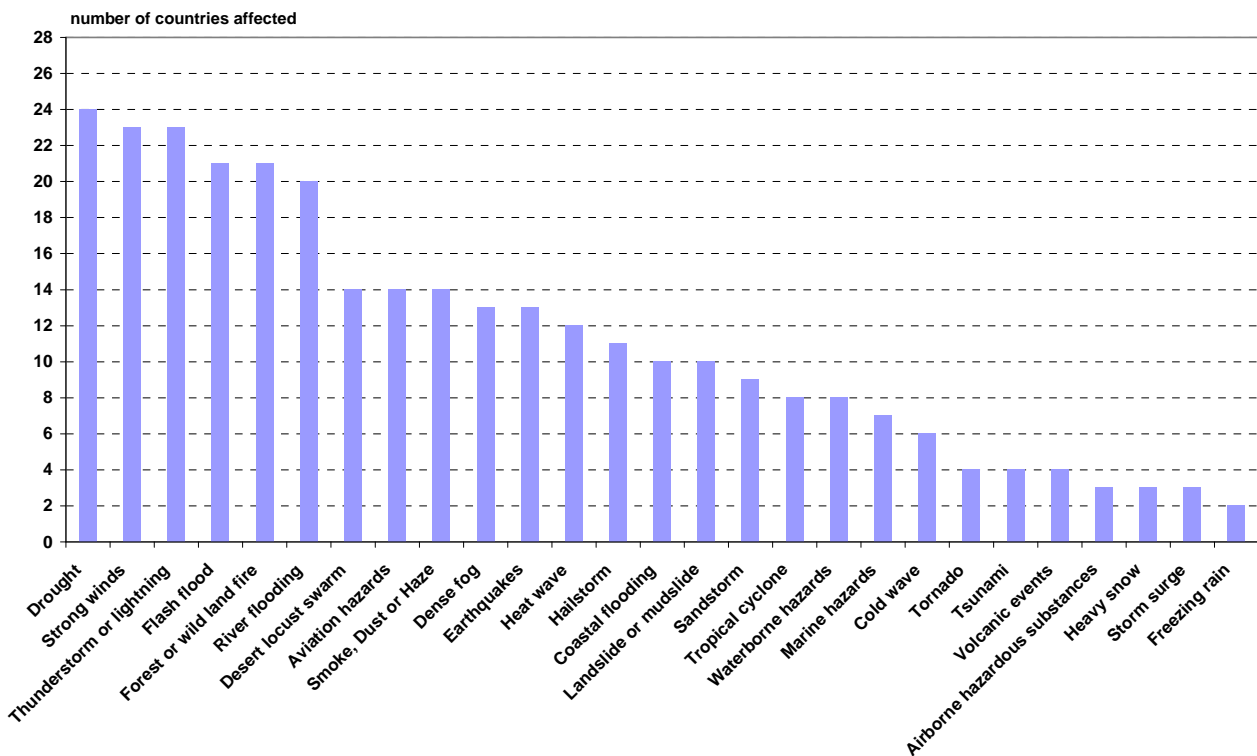
This chapter centres on the assessment of the survey responses from African NMHSs (WMO RA I). Its internal structure follows the sequence outlined earlier in section 2.5

## 4.2 Response to the Survey in Africa

The 28 African NMHSs who contributed responses to the WMO country-level survey are listed in Annex 2.

## 4.3 Hazards affecting Countries in Africa

Figure 7 below presents the number of responding countries in Africa (WMO RA I) who identified themselves as being affected by the specified hazards.



**Figure 7. Number of responding African countries who identified themselves as being affected by specified hazards.**

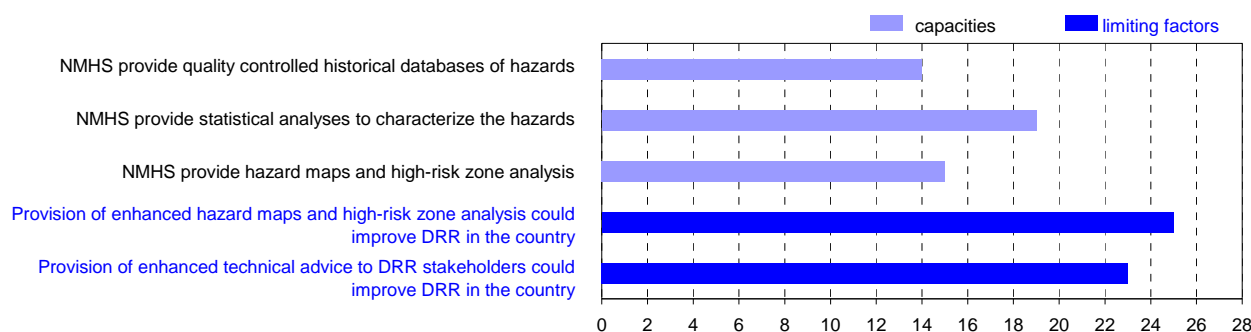
It is important to note that the survey data presented in Figure 7 simply indicates how many countries are exposed to the individual hydrological and meteorological hazards. The survey responses do not provide information on the magnitude of the impacts (or the “disaster-causing potential”) of specific hazards or imply that a less widely occurring hazard may not result in disasters. Tropical cyclones, for example, are ranked lower on the list because they affect relatively few countries in Africa but the heavy rains and high winds associated with them do, on occasion, cause major disasters in those countries that experience them, such as widespread flooding, severe erosion and destruction of homes and other buildings.

### 4.3.1 Access to Data on Hazards and their Impacts

Most African NMHSs who responded to the survey (79% or 22 out of 28 respondents) stated that a designated national agency other than the NMHS was responsible for providing official information on the impacts of disasters in their country. More than half (57% or 16 of 28) of them went on to

state that they had access to official, reliable, information on impacts<sup>4</sup>. However, three NMHSs (11%) indicated that they maintained and regularly updated their own internal database of official information on the impacts of hazards<sup>5</sup>. Annex 3 presents an overview of the hazard databases maintained by survey respondents in Africa and includes some supplementary information on related metadata and impacts information.

#### 4.3.2 Value Added Services based on Historical Hazard Data



**Figure 8. Provision of hazard information by NMHSs in Africa.**

From the African survey responses, as seen in Figure 8 above, roughly three quarters of African NMHSs (73% or 19 of 26) reported that they provided technical advice on hazards with somewhat fewer (70% or 19 of 27) providing statistical analyses to characterize them. About half (52% or 14 of 27) maintained quality controlled historical databases of hazards and a similar number (56% or 15 of 27) provided hazard mapping and high-risk zone analysis. Only slightly over a third of respondents (37% or 10 of 27), however, indicated that they provided analyses of the potential impacts of hazards.

A majority of responding NMHSs identified several factors that limited their ability to provide hazard data products. These included the availability of professional staff with appropriate training (74% or 20 of 27 responses), quality assurance (74% or 20 of 27), data rescue (74% or 20 of 27), the ability to archive and update (63% or 17 of 27), and the customization of data for stakeholders (65% or 17 of 26). Overwhelmingly (96% or 24 of 25), respondents felt that the provision of enhanced value-added services in support of hydrometeorological risk assessment would strengthen their contributions to disaster risk reduction activities, identifying the following specialized services as particularly relevant - analyses of the potential impacts of hazards (96% or 25 of 26), hazard mapping and high-risk zone analysis (96% or 25 of 26) and technical advice (92% or 23 of 25).

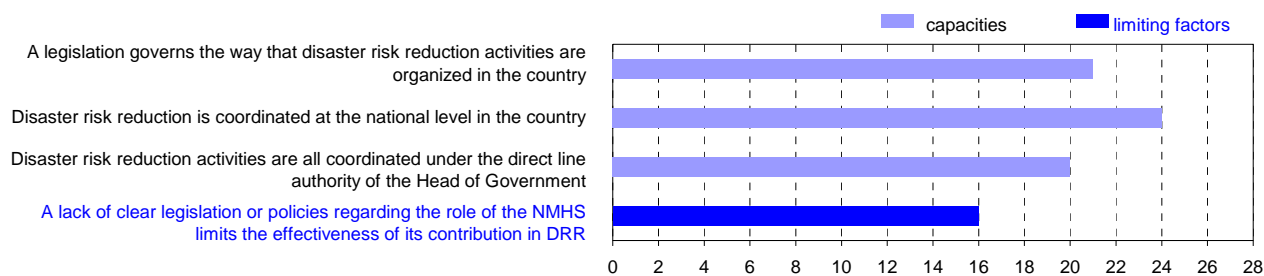
#### 4.4 The National Context for Disaster Risk Reduction

National legislative, governance and organizational structures establish the context within which NMHSs make their contributions to safety of life and property. The following sections summarize the survey responses regarding national systems for disaster risk reduction in Africa, the impacts of these systems on African NMHSs and the involvement in and contributions made to their countries' disaster risk activities by the NMHSs.

<sup>4</sup> All percentage figures quoted in this report have been calculated by dividing the number of "yes" responses to a particular question by the total number of responses to that question that were received. The number of responses received often varied from one question to another.

<sup>5</sup> It is important to note, that, to date, no systematized, universally accepted, methodology or protocol has been established on a global basis for the creation and maintenance of hazard and hazard impacts databases.

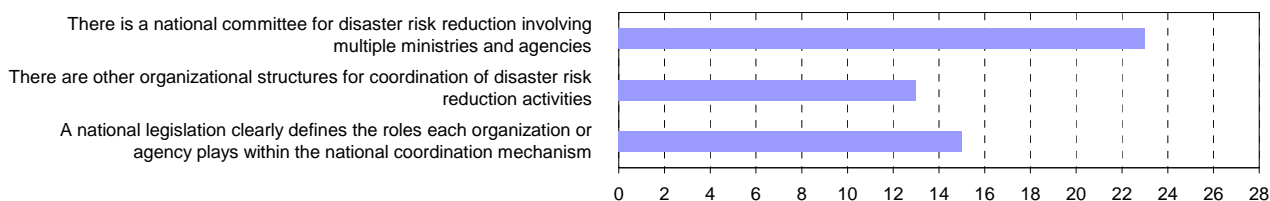
#### 4.4.1 Legislation and Governance



**Figure 9. Legislation and coordination in support of disaster risk reduction at the national level in Africa.**

From the African survey responses, as seen in Figure 9 above, a large majority (86% or 24 of 28) of African respondents to the survey reported that disaster reduction activities were coordinated at the national level, usually under the direct line authority of the head of government (83% or 20 of 24). In over half of responding countries (56% or 14 of 25) all disaster risk reduction activities were coordinated under one ministry. Most African respondents (75% or 21 of 28) also indicated that legislation governed the way that disaster risk reduction was organized in their countries. At the same time, roughly two thirds of respondents (67% or 16 of 24) considered that a lack of clear legislation or policies regarding the role of the NMHSs limited their contributions to disaster risk reduction. This is not surprising, however, given that the mandates of National Meteorological and Hydrological Services in Africa usually predate the adoption of Disaster Risk Reduction as a national, regional and global priority.

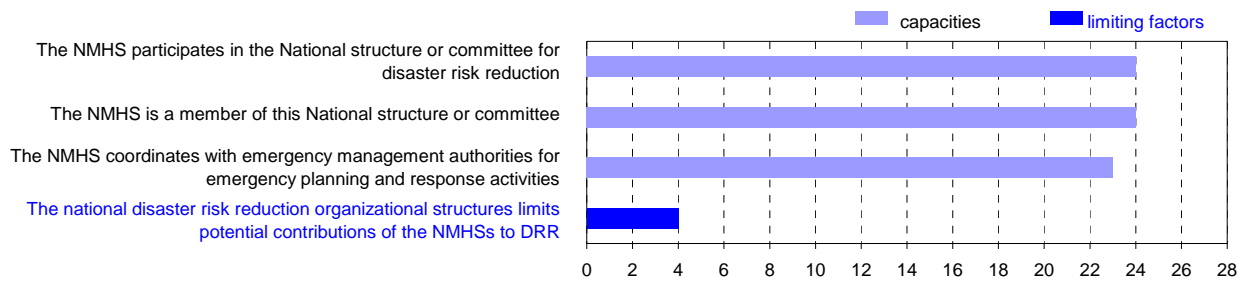
#### 4.4.2 National Structures/Mechanisms for Disaster Risk Reduction



**Figure 10. National structures for coordination of disaster risk reduction in Africa.**

Most African respondents (85% or 23 of 27) reported that their countries had a national committee for disaster risk reduction that involved multiple ministries and agencies and also (88% or 24 of 27) stated that their NMHSs were members of their respective national coordinating committees. Slightly over half of them (56% or 15 of 27) stated that the roles of each participating agency in the national coordination mechanism were defined by legislation. A similar number (54% or 13 of 24) pointed out that there were, in addition, other organizational structures for coordination. However, a minority of NMHSs (15% or 4 of 26) felt that the national organizational structure in their countries limited their contributions to disaster risk reduction.

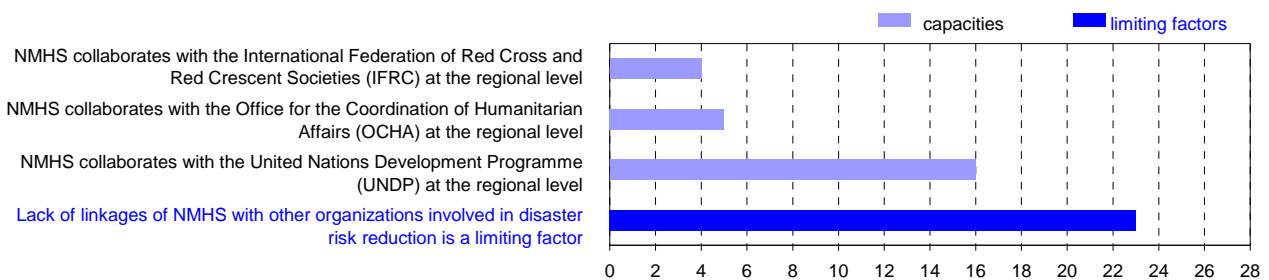
### 4.4.3 Contributions of NMHS to National Disaster Risk Reduction Structures/Mechanisms



**Figure 11. NMHS participation in national structures for disaster risk reduction in Africa.**

Most NMHS (88% or 24 of 27) reported that they were members of their respective national coordinating committees for disaster risk reduction though, as noted earlier, a significant minority (15%) went on to suggest that their own national coordinating structure limited their contributions to disaster risk reduction. All respondents (100% or 28 of 28) indicated that they provided support to agencies responsible for disaster risk reduction at the national level. Most of this support (93% 26 of 28) was directed towards disaster prevention, emergency planning and preparedness or towards emergency response operations (89% or 25 of 28), with somewhat less (65% or 17 of 26) being devoted to post-disaster reconstruction. Most NMHSs (89% or 25 of 28) also provided support to provincial or state government disaster-related activities while a somewhat smaller number (65% or 17 of 26) extended it to municipal or local levels. A large majority of NMHSs (85% or 23 of 27) pointed to inadequate linkages with other involved organizations (e.g. emergency planners, emergency response agencies) as limiting their contributions to disaster risk reduction. It is noteworthy that a majority of respondents (88% or 21 of 24) considered that their contributions would be enhanced by the existence of a “readiness system” that involved all agencies and services engaged in disaster risk reduction in well-coordinated responses to early warnings and related information issued by the NMHS.

### 4.4.4 NMHS Collaboration with other Partners



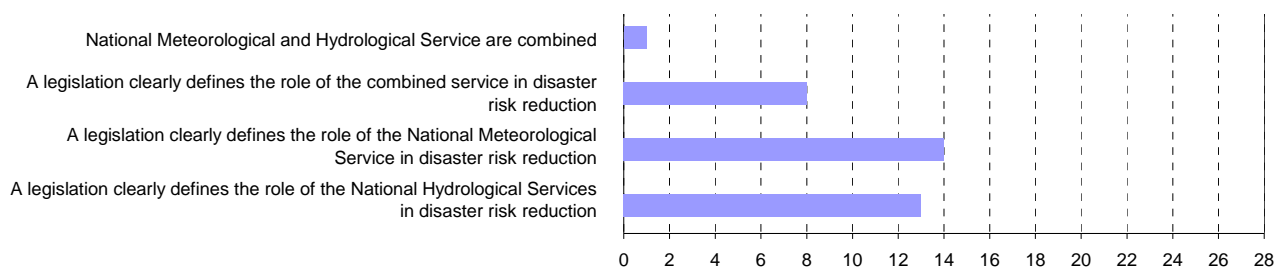
**Figure 12. NMHS collaboration with partner agencies at the regional level in Africa.**

A large majority of responding NMHSs (92% or 24 of 26) coordinated with partners at the national level, with most (88% or 21 of 24) indicating that they coordinated with emergency management authorities for emergency planning and response. More broadly, about three quarters (76% or 16 of 21) participated in activities of the United Nations Development Programme (UNDP) and about two thirds (67% or 12 of 18) in activities of international organizations and/or on the level of a WMO Region or a regional economic grouping (67% or 18 of 27). A similar number (67% or 18 of 27) interacted with the office of the United Nations Coordinator in their country. Notably, however, less than half of respondents (35% or 9 of 26) collaborated with their National Red Cross and Red Crescent Societies. Furthermore, a large majority (85% or 23 of 27) cited inadequate linkages with other disaster-related organizations as limiting their contributions to disaster risk reduction.



#### 4.4.5 The Organization and Priorities of NMHSs in Africa

The orientation and the priorities of NMHSs are, inevitably, influenced by the missions and priorities of their parent government Ministries or Departments. A parent department with a civil aviation mandate may, for example, emphasize provision of meteorological services to aviation while one with a natural resources or environment mandate might encourage its NMHS to provide warnings and other services to a broader range of sectors. As a result, the orientation of NMHSs may be more broadly focussed in some countries than in others. NMHSs, NMSs and NHSs in Africa report to a fairly broad spectrum of parent Ministries or Departments. Where National Meteorological Services or combined National Meteorological and Hydrological Services<sup>6</sup>, are concerned, parent ministries include: Transport; Tourism & Air Transport; Economic Infrastructure; Communication; Civil Aviation; Environment and Natural Resources; Public Works, Transport and Meteorology; Land Use, Water and Environment; Transport and Communication and Transport and Civil Aviation. Correspondingly, the parent ministries of National Hydrological Services in Africa include: Agriculture and Hydraulics; Environment, Lands, Water, Forestry and Mines; Environment, Wildlife and Tourism; Hydraulics, Environment and Combating Desertification; Minerals, Energy and Water Affairs; Infrastructure Development; Natural Resources; Public Works and Housing; Water, Lands and Environment; Higher Education and Scientific Research; and Agriculture and Animal and Water Resources.



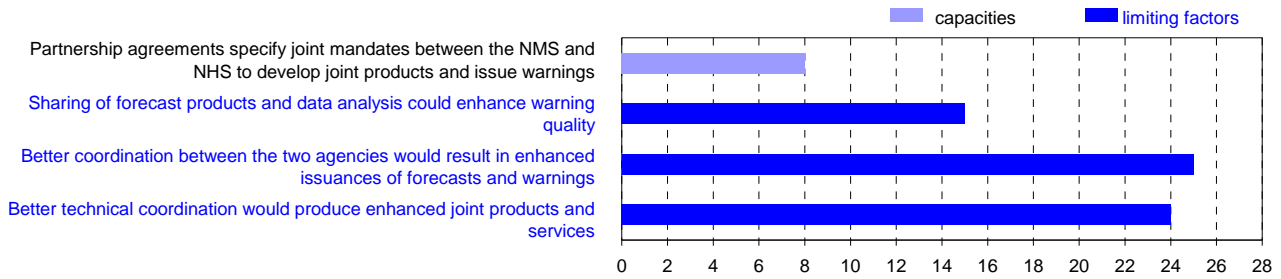
**Figure 13. Operational Coordination between NMSs and NHSs in Africa.**

The internal organization of National Meteorological and Hydrological Services within individual countries can also influence their ability to deliver well-coordinated hydrometeorological warnings and other services in support of disaster risk reduction. In Africa, roughly half of respondents (52% or 14 of 27) with separate NMSs and NHSs reported that they had legislation that clearly defined the role of their NMSs in disaster risk reduction and a similar percentage (52% or 13 of 25) applied to legislation regarding the role of their NHSs. At the same time, however, roughly three quarters (73% or 19 of 26) of respondents considered that legislation or partnership agreements were needed to better define the respective roles of their NMSs and NHSs in disaster risk reduction. It should be pointed out that, even though only one respondent in Africa reported that they had a combined National Meteorological and Hydrological Service, a sizeable number (53% or 8 of 15) indicated that their country had national legislation that clearly defined the NMHSs role in disaster risk reduction. This suggests that there was ambiguity in the interpretation of related questions in the survey questionnaire.

As noted earlier, the mandates of African National Meteorological and Hydrological Services have, in many instances, been legislated many years prior to the International Decade for Natural Disaster Reduction (IDNDR) and the endorsement of the Hyogo Framework for Action. The recognition of disaster risk reduction as an overriding priority can, therefore, represent a significant paradigm shift for them, their parent departments and their national partners. In such circumstances, NMHSs' mandates will need to be updated and harmonized with the new priority if they are to contribute effectively to it.

<sup>6</sup> Parent departments of NMS and NMHS have been grouped together due to ambiguities in responses regarding the existence or otherwise of combined NMHSs.

#### 4.4.6 Operational Coordination between NMSs and NHSs



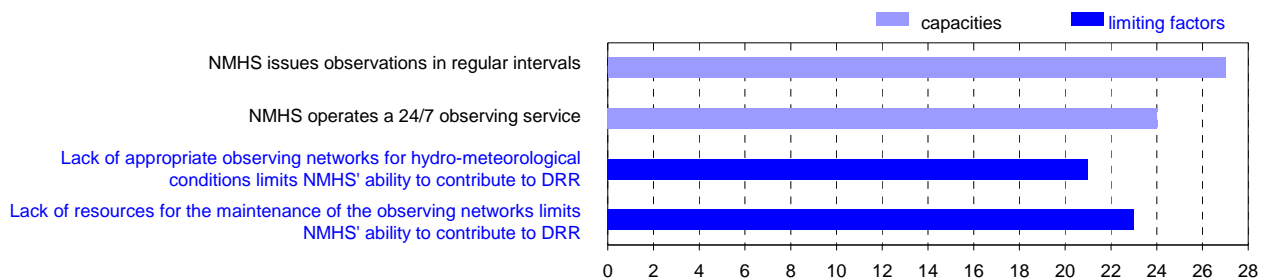
**Figure 14. Coordination between NMS and NHS in Africa.**

Roughly 30% (8 of 27) of African respondents from countries with separate NMSs and NHSs stated that partnership agreements were in place specifying mandates between the two Services to develop joint products and issue warnings. Over half (56% or 15 of 27) the respondents from such countries stated that the two agencies shared forecast products and data analysis that could enhance warning quality. Slightly less than half (44% or 12 of 27), however, indicated that coordination took place before hydrometeorological hazard warnings were issued. Moreover, the same number (44% or 12 of 27) reported that there was no coordination on hazard warnings. Virtually all respondents (96% or 25 of 26) considered that better overall coordination between the two agencies would enhance issuance of forecasts and warnings and a similar number (96% or 24 of 25) felt that better technical coordination would result in enhanced joint products and services.

#### 4.5 NMHSs Infrastructure, Products and Services

The following sections summarize the information contained in the survey responses related to observational networks, telecommunications systems, warning and forecast production systems and products, dissemination systems and related aspects of the overall operational capacities of the NMHSs in Africa.

##### 4.5.1 Observation and Monitoring Networks and Systems



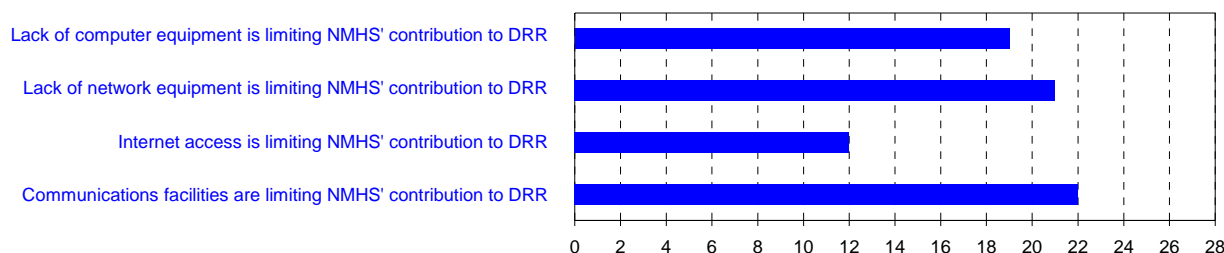
**Figure 15. Observation and monitoring networks and systems in Africa.**

All African respondents to the survey (100% or 27 of 27) stated that they had an operational observing capacity that issued observations at regular intervals. In most instances (89% or 24 of 27), the observing system was reported to operate on a 24 hourly/year-round basis<sup>7</sup>. In some

<sup>7</sup> Survey responses indicated that not all NMHSs in Africa had a 24 hourly/year-round observational program but were ambiguous as to the exact number (e.g. 23 stated that they had 24 hourly/year round observations but 22 identified the lack of such a service as a limiting factor).

cases (30% or 7 of 23), the observation networks included sea level monitoring stations. Most respondents (88% or 21 of 24), however, considered that the lack of appropriate hydrometeorological observing networks limited their ability to contribute to disaster risk reduction and almost half (48% or 12 of 25) identified the availability of a dedicated 24-hourly/year-round observing service as a limiting factor. Most respondents (93% or 25 of 27) also drew attention to the major challenges that they faced in maintaining hydrometeorological observing networks, citing a lack of resources (e.g. financial, replacement parts, personnel, etc) while a smaller number (30% of 7 of 23) drew attention to the impact on their networks of hazard related damage.

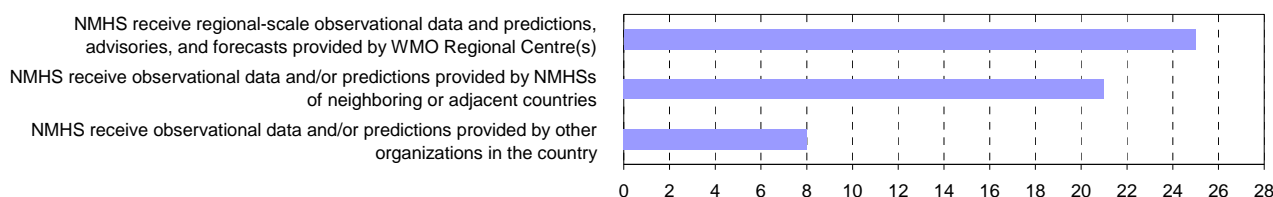
#### 4.5.2 Telecommunications and Informatics



**Figure 16. Telecommunication and informatics in Africa.**

The majority of African NMHSs who responded to the survey (88% or 23 of 26) reported that their telecommunications systems were available 24-hourly/year round. Some confirmation was provided by responses indicating that, in most (83% or 20 of 24) cases, forecasting staff had access to real time hydrometeorological data. However, a large majority of respondents (88% or 22 of 25) also identified that their ability to deliver critical products for disaster risk reduction was limited by communications facilities. Compounding limitations on NMHSs' capacities to support disaster risk reduction were cited in major areas of informatics, with most respondents (92% or 24 of 26) highlighting the unavailability of application software, network equipment (84% or 21 of 25) and computers (76% or 19 of 25). Half of them (50% or 12 of 24) drew attention to inadequate Internet access. Virtually all African respondents (96% or 25 of 26) considered that upgrading the operational infrastructure for forecasting and warning services would enhance disaster risk reduction capacities in their countries.

#### 4.5.3 Data Exchange

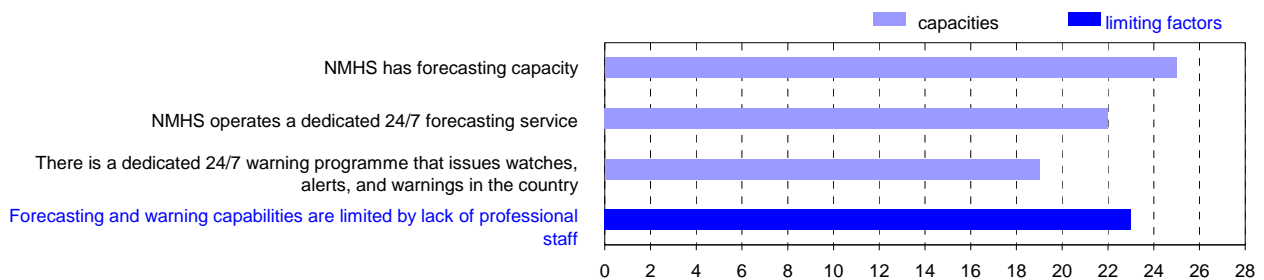


**Figure 17. Data exchange in Africa.**

Survey responses from NMHSs in Africa identified that most (83% or 20 of 24) forecasting staff had real time access to hydrometeorological data. In addition, most NMHSs (93% or 25 of 27) used regional scale observational data and forecasts provided by WMO Regional Specialized Meteorological Centres and most (81% or 21 of 26) also used data or predictions from neighbouring countries. Some NMHS (31% or 8 of 26) forecasters also used data and/or predictions provided by other organizations in their countries. In addition, more than half of respondents (59 or 13 of 22) indicated that they received real time marine observations from the WMO Global Telecommunications System (GTS) and some (27% or 4 of 15) relayed sea level

observations on that global network. Conversely, however, most respondents (88% or 22 of 25) indicated that their NMHSs were limited in their ability to deliver critical products and services for disaster risk reduction by communications facilities. Furthermore, almost three quarters (74% or 20 of 27) stated that their NMHS was limited in its ability to provide hazard data products by quality assurance, two thirds (65% or 17 of 26) by customization of data for stakeholders and a similar number (63% or 17 of 27) by ability to archive and update. Most responding NMHSs (96% or 26 of 27) considered that they required better coordination with neighbouring NMHSs and RSMCs (96% or 25 of 26) in relation to hydrometeorological data exchange in order to enhance their countries' disaster risk reduction activities.

#### 4.5.4 Forecast and Warning Capability



**Figure 18. Forecast and warning capabilities in Africa.**

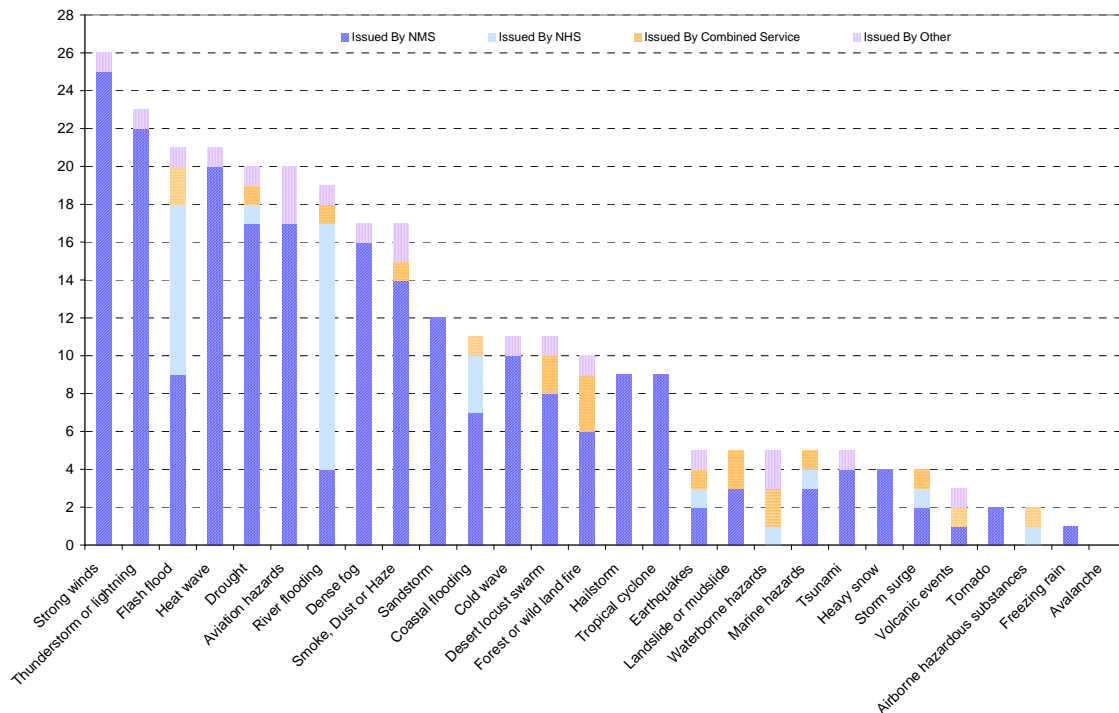
Almost all African NMHSs (93% or 25 of 27) who responded to the country-level survey reported that they had an operational forecasting capability. Most (85% or 22 of 26) said that it was a dedicated 24-hourly/year-round forecast service and many (90% or 18 of 20) stated that a meteorologist was required to be on-site to operate this service. Almost three quarters of respondents (70% or 19 of 27) reported that they had a dedicated hazard warning programme that issued watches, alerts and warnings on a 24-hourly/year-round basis and almost all of these (86% or 18 of 21) indicated that a meteorologist was on site during the operational hours of the warning programme. In addition, about two thirds of responding NMHSs (65% or 15 of 23) indicated that they provided a marine forecast and warning service to mariners and coastal zone users and one of them also prepared marine forecasts for the Global Maritime Distress and Safety System (GMDSS). Conversely, however, most respondents stated that their NMHSs were limited in their ability to deliver critical products and services for disaster risk reduction by application software (92% or 24 of 26), professional staff (88% or 23 of 26) or computers (76% or 19 of 25). Furthermore, all responding African NMHSs (100% or 26 of 26) considered that upgrading their operational forecasting and warning services would enhance disaster risk reduction in their countries, with most (92% or 24 of 26) advocating the upgrading or technical training of professional staff.

#### 4.5.5 Forecast and Warning Products

The survey responses referenced earlier in Figure 7 indicated that the six hydrometeorological hazards affecting the greatest numbers of African respondents were, in declining order, strong winds, flash floods, thunderstorms and lightning, drought, river flooding and forest and wild land fires<sup>8</sup>. Table 3 in Annex 4 summarizes information on hazard warnings and products issued by NMHSs in Africa who responded to the survey. Examination of the data in Table 3 reveals that virtually all affected NMHSs issued warnings for the first five of the preceding hazards but that only about half of them issued warnings for forest and wild land fires. Where less widely occurring, but

<sup>8</sup> The survey responses do not provide information on the magnitudes of the impacts associated with individual hazards, simply that they occur in the reported number of countries.

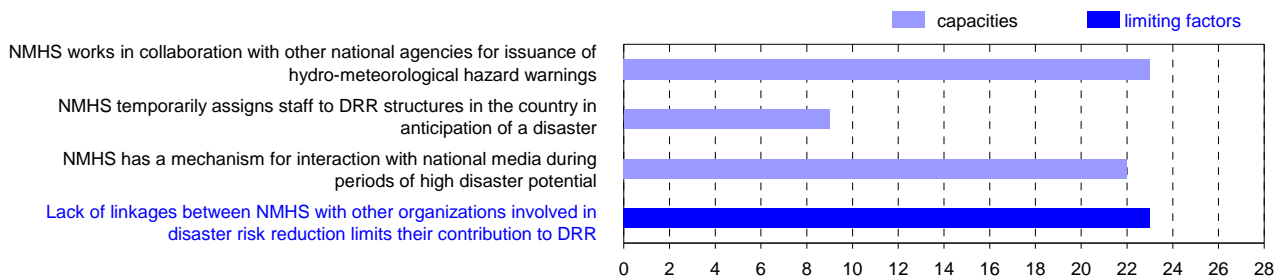
nevertheless potentially very severe, hazards are concerned, this latter pattern also often prevails. For example, survey responses indicated that 10 countries were affected by landslides or mudslides but warnings for these phenomena were issued in only five of the countries. Equally, 4 African countries were reported to be affected by tornadoes but warnings for these phenomena were issued in only two countries. At the same time, a substantially higher number of NMHSs reported that they issued warnings for aviation hazards and reductions to visibility (dense fog; smoke, dust or haze). Whether the preceding anomalies or weaknesses reflect a lack of predictive capacity, an organizational bias towards provision of meteorological support to aviation, or simply the traditional orientation of NMSs in some countries is largely irrelevant. What is important in the present context is that NMHSs should strive to re-orient their programmes and services to provide the best possible support to disaster risk reduction, as an overarching priority. This will require that their hazard warning programmes address all hydrometeorological hazards that can potentially lead to disasters and for which predictive skill can be said to exist.



**Figure 19. Agencies mandated for issuance of warnings in Africa.**

The African survey responses, as seen in Figure 19 above, also reveal that National Meteorological Services were the issuers of virtually all warnings for the top hazards, with the only exceptions being flash floods and river flooding where National Hydrological Services or combined National Meteorological and Hydrological Services become major players. The survey data also suggest that the NMHSs, (or, as the case may be, NMSs or NHSs) are not the sole issuers of warnings for the most common hazards in a number of the responding countries but that there are other competing warning services. However, roughly half the NMHSs who issued warnings for the top hazards indicated that they included information about their potential impacts in their warning bulletins. Moreover, virtually all responding NMHSs considered that further improvements to their warnings were necessary. One apparent anomaly is in the case of airborne hazardous substances, said to be a concern in three countries, where the survey responses indicated that warnings were issued in two countries and in one of these cases by a National Hydrological Service.

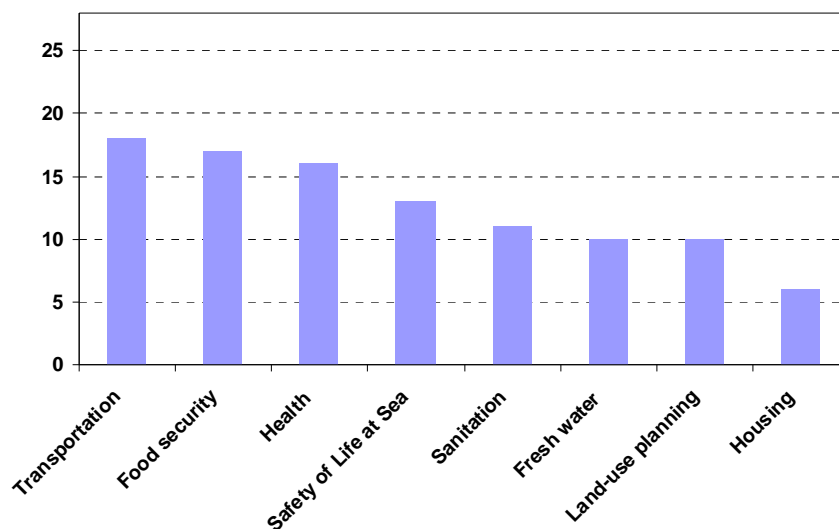
#### 4.5.6 Coordination of Warnings



**Figure 20. External coordination for issuance of warnings in Africa.**

Early warnings of hydrometeorological hazards represent a vital contribution to disaster risk reduction. In Africa, most responding NMHSs (85% or 23 of 27) reported that they worked in collaboration with other agencies (e.g. agriculture, aviation, etc) with respect to hazard warnings and many of them (59% or 13 of 22) discussed the hazard’s characteristics and potential impacts with these agencies prior to issuing a warning. In addition, all respondents (100% or 22 of 26) stated that they had a mechanism for interaction with their country’s media during periods of high disaster potential. A significant number (35% or 9 of 26) also indicated that they temporarily assigned staff to disaster risk management structures in anticipation of a disaster. Several NMHSs (28% or 7 of 25) also pointed out that there were other public or commercial entities that provided competing warning services in their countries. Almost all respondents (96% or 26 of 27) considered that their NMHSs required better coordination of watches and warnings with the WMO Regional Specialized Meteorological Centres and with neighbouring NMHSs (93% or 25 of 27).

#### 4.5.7 Products and Services for Selected Socio-Economic Sectors



**Figure 21. NMHS provision of services to selected economic sectors in Africa.**

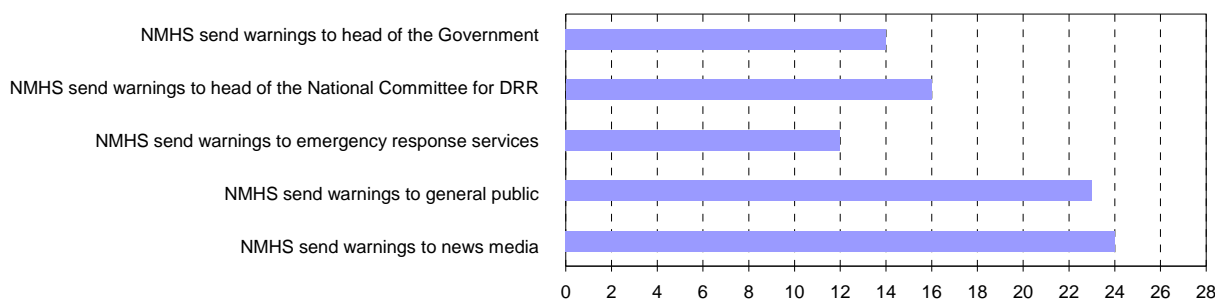
As a further refinement, Figure 21 illustrates the provision by NMHSs of specialized alerts, warnings and other products to significant socio-economic sectors that can be seriously affected by hazardous events. In the context of disaster risk reduction, it is noteworthy from Figure 21 that only slightly more than one quarter (29%) of responding NMHSs indicated that they provided



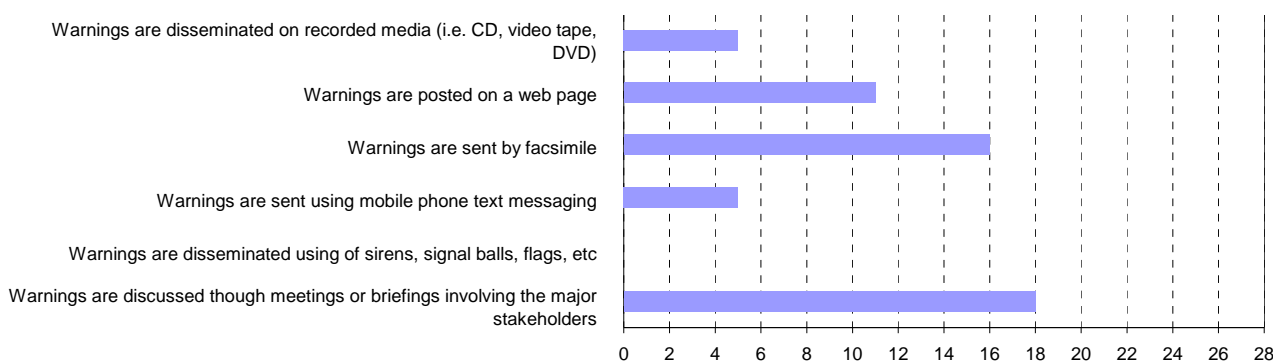
support to development and housing and only approximately a half of them provided support for the land-use planning (50%), fresh water (48%) and sanitation sectors (52%).

#### 4.5.8 Dissemination Systems and Target Audiences

The following Figures 22 and 23 summarize the survey responses relating to the dissemination of hazard products by NMHS in Africa. They provide information on the types of products that are disseminated, to whom they are provided and on the methods of dissemination that are used to convey the products to the recipients. The same information is also presented in numerical form in Table 2 in Annex 5 where the figures represent the number of responding NMHSs who reported that they provided the specified product to the indicated target audience or, as appropriate, utilized a particular means of dissemination.



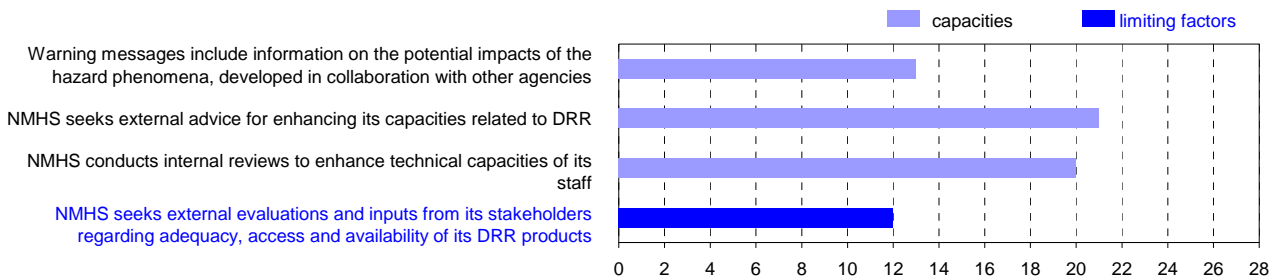
**Figure 22. Warning target audience in Africa.**



**Figure 23. Warning dissemination methods in Africa.**

As might be expected virtually all respondents from Africa indicated that they disseminated hazard warnings to the public and the media. In a majority of cases, warnings were also disseminated to relevant government departments and authorities and businesses. It is noticeable, however, that a much lower percentage of responding NMHSs disseminated warnings and other products to external partners in disaster risk reduction such as the Red Cross and Red Crescent Society, the UNDP and others. However, meetings, briefings, facsimile and mail were the most common dissemination methods though Internet seemed to be approaching the former in importance.

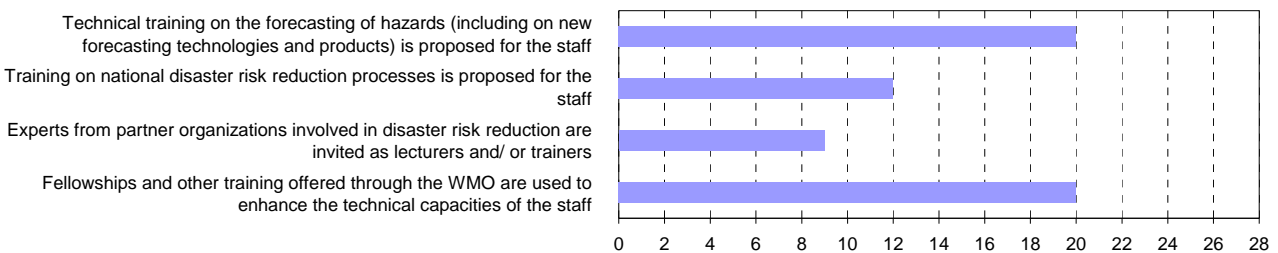
### 4.5.9 Product Utility and Product Improvement



**Figure 24. Ongoing feedback and improvement of products in Africa.**

All (100% or 10 of 10) NMHSs in Africa who responded to the question indicated that they work with other agencies with respect to hazard warnings. The same number (59% or 10 of 17) stated that they had regular interaction with disaster risk authorities to enhance their warning capabilities and content. About half (54% or 13 of 24) of NMHSs who included information on potential risks (impacts) in warning statements indicated that they collaborated with other agencies to develop risk information. In addition, over three quarters (84% or 21 of 25) stated that their NMHSs sought external advice for enhancing their capacities to support disaster risk reduction. Most (88% or 23 of 26) sought advice to enhance monitoring and forecasting, watches and warnings (80% or 20 of 25), or overall products and services (72% or 18 of 25). Less than half the respondents (44% or 12 of 27) indicated that their NMHSs had a quality control mechanism to enhance their warning capabilities and content. Most of these (59% or 10 of 17) reported that it provided for regular interaction with stakeholders (disaster risk authorities). Somewhat fewer (47% or 8 of 17) stated that it also included feedback from stakeholders and the public after an event had occurred. Less than half (41% or 7 of 17) reported that the mechanism provided for training for stakeholders to understand the hazards, warnings and their implications. Some NMHSs (46% or 12 of 26) stated that they sought external evaluations and inputs from stakeholders regarding the adequacy, relevance, method of access and availability of their disaster risk reduction products. Most respondents (96% or 25 of 26) believed that the lack of public understanding of the effects of hazards limited the public response to them and some (96% or 8 of 10) considered that the lack of public understanding of watches and warnings similarly limited the response. Respondents universally (100% or 26 of 26) thought that the lack of joint training between staff of the NMHSs and emergency authorities and managers limited their disaster risk reduction efforts. Reflecting the preceding realities, all responding NMHSs (100% or 27 of 27) suggested that educational modules for media, public and disaster risk authorities would enhance their effectiveness in disaster risk reduction.

### 4.5.10 Internal NMHS Training and Capacity Enhancement



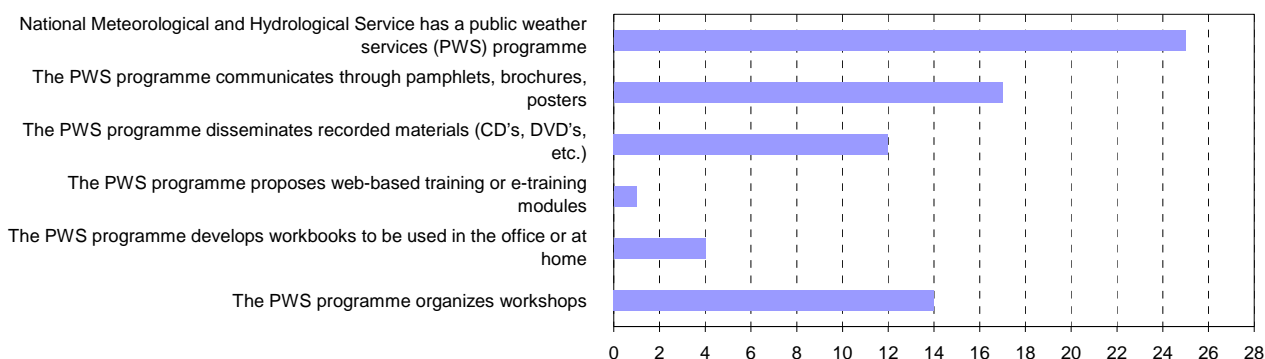
**Figure 25. Training and capacity building of NMHS' staff in Africa.**

In Africa, about three quarters (74% or 20 of 27) of NMHSs who responded to the survey indicated that they provided ongoing technical training to staff on forecasting of hazards, including up to date



training of new forecasting technologies and products. The same number stated that they utilized Fellowships and other training offered through WMO to enhance the technical capacities of staff and that they conducted internal reviews and sought staff inputs to enhance their capacity building and technical training activities. Just over one third of responding NMHSs (37% or 10 of 27) conducted evaluations of the suitability of communications, workstations, and software to support disaster risk reduction but a slightly larger number (44% or 12 of 27) implemented upgrades to these systems. Almost half of reporting NMHSs (48% or 12 of 25) provided training to staff on their country's disaster risk reduction processes and related topics and a majority of these (35% or 9 of 26) invited experts from partner organizations involved in disaster risk reduction as lecturers and/or trainers. However, only half of them (24% or 6 of 25) reported that they held or participated in joint training activities for NMHSs staff and emergency response agencies. Balancing the preceding realities, roughly three quarters of respondents (74% or 20 of 27) stated that (lack of) professional staff with appropriate training limited their ability for real time monitoring of hazards and providing hazard data products. Almost as many (76% or 19 of 25) indicated that lack of forecaster training at the NMHSs reduced the effectiveness of their warning services. Expanding on this theme, all respondents (100% or 26 of 26) stated that a lack of joint training involving NMHSs staff and disaster risk managers limited their contributions to disaster risk reduction, while a slightly lower number (96% or 25 of 26) pointed to the lack of joint training with emergency authorities and managers as a limiting factor. Finally, almost all (96% or 26 of 27) identified the lack of joint training with the media as a further limiting factor. Not surprisingly, all NMHSs who responded to the survey question (100% or 26 of 26) considered that upgrading and improving their operational forecasting and warning activities would enhance their disaster risk capacities. They (96% or 26 of 27) advocated the value of cross-border training activities with neighbouring NMHSs, targeted at common hydrometeorological hazards.

#### 4.5.11 Outreach Activities



**Figure 26. Outreach activities in Africa.**

Outreach activities aimed at the general public and other stakeholders are an important component of any effective disaster risk reduction programme. Within NMHSs, outreach activities are often part of a public weather services programme. In Africa (RA I), most NMHSs (93% or 25 of 27) who responded to the survey identified that they had a public weather services programme. Less than half (41% or 7 of 17) of respondents, however, stated that their NMHS quality control programme included training for the stakeholders to understand hazards, warnings and their implications. Similar percentages (44% or 12 of 27) indicated that they provided education and training on hazards, watches, warnings, etc to disaster risk reduction and operational emergency response managers or held joint training sessions with them. Slightly fewer (41% or 11 of 27) provided training to the news media. Less than a third of respondents (30% or 8 of 27) identified that they provided training targeted at the trainers (i.e. of disaster risk authorities, emergency response staff, media, etc) and an even smaller number (19% or 5 of 26) provided educational modules and training programmes targeted at the general public. The following materials and methods were

identified by respondents as being used in NMHS public outreach programmes in Africa: - pamphlets, brochures, posters (71% or 17 of 24), workshops (64% or 14 of 22), recorded materials (CDs, DVDs, etc) (50% or 12 of 24), Web-based training (23% or 5 of 22), workbooks for office or home use (17% or 4 of 24), and E-training modules (4% or 1 of 23).

Almost all (96% or 25 of 26) respondents considered that the lack of public understanding of the effects of hazards limited the public response to warning services and that the lack of joint training between with emergency authorities and managers limited their disaster risk reduction efforts. All respondents (100% or 26 of 26) felt that the lack of joint training between NMHS staff and disaster risk managers was a further limiting factor and most (96% or 26 of 27) also identified the lack of joint training with the media as such. In view of the preceding, it is not surprising that respondents universally (100% or 27 of 27) suggested that educational modules that NMHSs could target at media, public and disaster authorities would enhance their effectiveness in disaster risk reduction.

#### **4.5.12 NMHS Contingency Planning**

Less than half of responding NMHSs in Africa (37% or 10 of 27) stated that their NMHS had a contingency plan to maintain the continuity of products and services in the event of organizational emergencies such as power failure or communications disruption. A few of these (36% or 4 of 11) indicated that their contingency plans involved agreements or protocols with neighbouring NMHS to support each other in the event of catastrophic failure. A small number (19% or 5 of 27) also stated that they conducted or participated in drills and exercises to ensure disaster preparedness. However, most respondents (93% or 25 of 27) identified needs for improved coordination with neighbouring NMHS and specifically cited the need for support from them in the event of disruption of services.

### **4.6 Overarching Factors**

NMHS participating in the country-level survey were asked to respond to a series of questions that centred on obtaining expressions of opinion from them regarding overarching factors or realities that either limited or could enhance their ability to make optimal contributions to disaster risk reduction. To varying degrees, NMHS responses to these questions also served to validate statements, expressions of opinion and/or recommendations contained in responses to earlier sections of the survey. The following summarizes the inputs that fall under the above broad category:

#### **4.6.1 NMHS Visibility**

Most respondents in Africa (92% or 24 of 26) indicated that their NMHS needed higher visibility and recognition within government as a major contributing agency to disaster risk reduction. A majority (75% or 18 of 24) felt that a lack of understanding by government authorities of the value provided by the NMHS limited their contributions to that priority area. All African respondents (100% or 26 of 26) considered that improved ministerial level understanding of the socio-economic benefits of hydrometeorological products and services would increase their national visibility of their NMHS.

#### **4.6.2 Organization and Governance**

A relatively small number of African NMHSs (15% or 4 of 26) felt that their national disaster risk reduction structure limited their potential contributions to disaster risk reduction. However, a sizeable majority (67% or 16 of 24) considered that the effectiveness of their contributions was limited by the lack of clear legislation or policies regarding their role (e.g. as the sole issuer of warnings of hydrometeorological hazards). As a particular concern, almost three quarters of respondents (73% or 19 of 26) from countries with separate NMSs and NHSs identified a need for legislation or partnership agreements to better define each agency's role in disaster risk reduction.

### 4.6.3 Coordination and Partnership

Most African NMHSs who responded to the survey (85% or 23 of 27) considered that their contributions to disaster risk reduction were limited by a lack of linkages between their NMHS and other involved organizations. Furthermore, almost all of them (96% or 26 of 27) felt that that better coordination with neighbouring countries and WMO Regional Specialized Meteorological Centres would improve their contribution to their own nation's disaster risk reduction activities.

### 4.6.4 Resources and Capacity

Almost all African NMHSs who responded to the country-level survey (96% or 26 of 27) stated that resources and infrastructure limited their ability to deliver critical products and services for disaster risk reduction. More specifically, most (92% or 24 of 26) identified financial resources and (88% or 23 of 26) professional staff as limiting factors. Consequently, all respondents (100% or 26 of 26) considered that upgrading and improving NMHSs operational forecasting and warning services would enhance the disaster risk reduction capacity within their country.

## 4.7 WMO Support

The following prioritized list summarizes the needs for support from WMO identified by the NMHSs in Africa who responded to the survey. Needs are identified in the order of priority assigned by the respondents.

1. Technology transfer, capacity building, technical guidelines and technical training (e.g. forecasting tools and methodologies, hazard mapping, and other inputs to risk assessment tools, etc.).
2. Provision of technical advice and specifications (e.g. to enhance observing networks, operational infrastructures, relevant products and services for disaster risk reduction applications).
3. Resource mobilization.
4. Assist members to contribute to the development of the national disaster risk reduction plans.
5. Advocacy for enhanced visibility of National Meteorological and Hydrological Service' in the area of disaster risk reduction.
6. Cost benefit analysis of hydro-meteorological services in disaster risk reduction.
7. Strengthening strategic partnerships with stakeholders (e.g. disaster risk managers, media, etc.).
8. Education, training and public outreach programmes in disaster risk reduction (e.g. targeted at National Meteorological and Hydrological Service and their stakeholders).
9. Strengthening strategic partnerships with other technical organizations and agencies (e.g. meteorology, hydrology, ocean services, etc.).
10. Establishment of regional emergency protocols for the National Meteorological and Hydrological Services in support of each other in case of disruption of services due to the impact of a disaster.

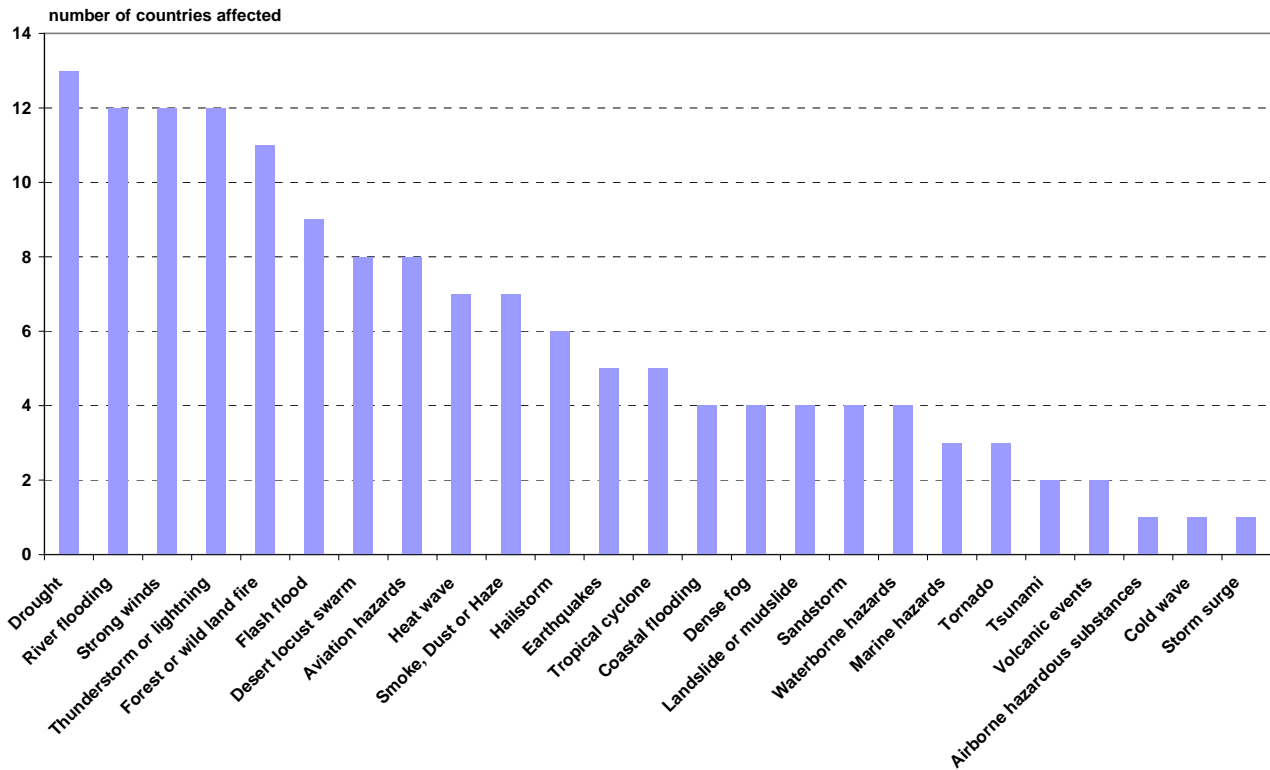
## 4.8 Sub-Regional Considerations

The following section examines the involvement and capacities of the NMHS in Least Developed Countries (LDC) in Africa in relation to disaster risk reduction. It presents a brief overview of similarities and differences between responses from African LDCs relative to African responses as a whole.

### 4.8.1 Least Developed Countries in Africa

Thirty-three out of a worldwide total of fifty Least Developed Countries (LDC) are located in Africa. Against the backdrop of the preceding analysis of all survey responses from African NMHSs, the following paragraphs briefly examine the responses from the 14 LDCs in Africa who are WMO Members and who responded to the country-level survey. These countries were: Burkina Faso, Comoros, Ethiopia, Guinea Bissau, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Senegal, Sudan, Uganda and the United Republic of Tanzania.

Broadly speaking, the survey responses from Least Developed Countries in Africa show a similar overall picture to those from the larger group of all African respondents. However, a number of specific aspects are worthy of note. Of interest is the fact that desert locust swarms, smoke, dust and haze, and aviation hazards affect a larger proportion of LDCs than was the case for African respondents as a whole (Figure 27).



**Figure 27. Number of responding Least Developed Countries in Africa who identified themselves as being affected by the specified hazards.**

On the organizational and governance level, proportionately more NMHSs from Least Developed Countries in Africa felt that their national disaster management organizational structure limited their contributions to disaster risk reduction than was the case for African respondents as a whole. In addition, all, as opposed to most, NMHSs from African LDCs endorsed the need for enhanced value added services based on hazard data records. Furthermore, a higher percentage of LDCs identified professional staff with appropriate training as a limiting factor on their ability to support disaster risk reduction. In addition, LDC respondents in Africa, almost without exception, identified a lack of adequate observational networks, trained professional staff, maintenance resources and money. In particular, almost three quarters of them identified the availability of a dedicated 24 hourly/year round observing programme as a constraining factor on their ability to support disaster risk reduction, as opposed to roughly half for all African respondents. In the critical area of early warning capacity, only half of African LDC respondents stated that they had a dedicated warning service that was operational round the clock, every day of the year – a poorer picture than for African respondents as a whole. Moreover, all African LDC respondents indicated that major deficiencies or limitations in their warning and forecast capacity arose from lack of professional staff, computers and applications software. Finally, as a compounding factor, fewer LDC NMHSs had a contingency plan to maintain services in emergency situations. In short, the infrastructure and capacities of NMHSs in Least Developed Countries in Africa will require significant enhancements if they are to provide state of the art support to disaster risk reduction.

## 4.9 Concluding Assessments for Africa

The following summarizes assessments and conclusions related to the analysis of the survey responses from African NMHSs presented in this chapter. In order to facilitate identification of subject areas, the titles associated with individual assessments and conclusions presented below match those used during the analyses of African survey responses outlined in the preceding pages.

### 4.9.1 Access to Data on Hazards and their Impacts (Ref. 4.3.1)

As Annex 3 illustrates, many NMHSs in Africa do not maintain records of even the most common hazards such as strong winds or thunderstorms and lightning. As agencies responsible for monitoring and prediction of hydrometeorological hazards within their countries, however, NMHSs (or NMSs and NHSs) may be expected to maintain records of occurrences of those hazards. Such records are important for various applications ranging from verification of warnings and forecasts to hazard mapping and analysis. **The survey responses substantiate the need for many NMHSs and countries in Africa to improve their archiving and access systems for hazard and impact data.**

### 4.9.2 Value Added Services based on Historical Hazard Data (Ref. 4.3.2)

The respondents' recommendation regarding enhanced value-added data services is strongly supported by earlier survey responses. These responses indicate that **most NMHSs in Africa would benefit from capacity development and training related to disaster risk applications**, including hazard and impact analysis, hazard mapping and risk zone analysis and preparation of enhanced products. It is also clear that quality controlled, regularly updated, hazard data archives remain to be established in almost half of the African NMHSs and that **there are associated requirements for capacity development related to data rescue, quality assurance and data management and archival techniques**. Development of the preceding capacities and capabilities will require significant investments in training and infrastructure along with the continued provision of resources to sustain the delivery of the enhanced services.

### 4.9.3 Legislation and Governance (Ref. 4.4.1)

Where it is felt to be essential to enhancing their contributions to disaster risk reduction, **NMHSs should press for clear policy direction regarding their roles and responsibilities.**

### 4.9.4 National Structures/Mechanisms for Disaster Risk Reduction (Ref. 4.4.2)

The degree to which NMHSs are integrated into national disaster risk reduction organizational structures and their operational relationships with civil protection agencies, planning authorities and important non-governmental partners exercise a significant influence on their ability to contribute effectively to disaster risk reduction. For optimum effectiveness, **state of the art NMHS scientific, technical and operational capacities must be mainstreamed into national planning, decision-making and disaster response structures and systems** and, in addition, be well connected to important non-governmental partners. African responses to the survey indicate that **general needs exist in most countries for enhanced involvement and integration of NMHSs into national disaster risk reduction systems** and for strengthened partnerships with other involved agencies and organizations. Increased involvement in mechanisms, processes and partnerships must, of course, be matched by adequate scientific, technical and operational capacity to produce and deliver timely, relevant and accurate products and services if NMHSs are to make truly effective contributions to disaster risk reduction.

### 4.9.5 Contributions of NMHS to National Disaster Risk Reduction Systems (Ref. 4.4.3)

The survey responses indicate that NMHSs in Africa should devote continuing attention to building effective working relationships with national disaster authorities by providing timely, accurate and relevant products and services for disaster risk reduction. **Those NMHSs who are not already members of their national coordinating committees should take the initiative to gain**

**membership** and become an integral part of their countries' disaster risk reduction system, if they are to make optimal contributions to that priority. Equally, the responses underscore the need for expansion and reinforcement of partnerships with other agencies and organizations involved in related activities. Experience elsewhere indicates that the respondents' recommendation for establishment of a national readiness system makes good sense and suggests that NMHSs should encourage the establishment such systems within their countries.

#### **4.9.6 NMHS Collaboration with other Partners (Ref. 4.4.4)**

The survey responses suggest that most NMHSs in Africa are not well connected to important non-government organizations, particularly their National Red Cross and Red Crescent Societies, and a substantial number are not well connected to important regional bodies or international organizations. Expanded collaboration and effective partnerships can benefit NMHSs through broader utilization of their products and services, enhance their visibility and influence, and result in more effective contributions to disaster risk reduction. Consequently, the **establishment and maintenance of such relationships should be given significant priority by NMHS management.**

#### **4.9.7 The Organization and Priorities of NMHSs in Africa (Ref. 4.4.5)**

The survey responses suggest that, in some countries in Africa, **legislation, policy direction or partnership agreements are needed to clarify the roles and responsibilities of their NMSs and NHSs** in relation to disaster risk reduction and, in particular, the issue of early warnings for hydrometeorological hazards. Where this is the case, clarification will need to be sought at the national level.

#### **4.9.8 Operational Coordination between NMSs and NHSs (Ref. 4.4.6)**

The survey responses clearly indicate **general needs for greatly enhanced operational coordination between NMSs and NHSs in Africa** if they are to provide optimal support to disaster risk reduction. Survey contributors' almost unanimous recommendation should, therefore, be pursued at the country level through immediate action to achieve effective operational coordination, particularly with respect to hazard warnings and other critical products.

#### **4.9.9 Observation and Monitoring Networks and Systems (Ref. 4.5.1)**

Reliable, round the clock, observations that are made available in real time are the essential raw material needed for the production of early warnings of hydrometeorological hazards, forecasts and other operational products. In addition, observation networks provide the historical observational data sets that are required for risk analysis, hazard mapping, return period calculations and generation of other data products required for disaster risk reduction applications. Furthermore, they provide essential ground truth measurements for the calibration of remotely sensed readings from earth satellites and other systems. In consequence, **every effort must be made to ensure that adequate hydrometeorological observation networks are established and maintained in operation on a 24-hourly/year-round basis.** This requires not only up-front investments in observational instrumentation and staff training but also, and often more problematic, the continuing commitment by national governments of adequate funding to sustain the ongoing operation and maintenance of their national observation networks for the foreseeable future. The survey responses confirm the need to devote particularly **urgent priority to upgrading the observational infrastructure and related human resources capacities of NMHSs in Developing and Least Developed Countries in Africa** if these countries are to acquire the observational data needed to support effective disaster risk reduction through early warnings and other data related products and services.

#### **4.9.10 Telecommunications and Informatics (Ref. 4.5.2)**

The respondents' recommendation for upgrading of operational infrastructure is strongly supported by the survey responses that confirm that deficiencies in telecommunications, Internet access,

computer hardware and software are widespread. These deficiencies undercut the abilities of NMHSs in Africa to contribute effectively to disaster risk reduction. As in the case of observational networks, rectifying these deficiencies will require not only up-front investments in telecommunications and informatics systems and in staff training but will also necessitate continuing commitment by national governments of adequate funding to sustain the ongoing operation and maintenance of their hydrometeorological telecommunications networks over the long term. Once again, the survey responses confirm the need for **urgent priority enhancement of NMHS telecommunications and informatics infrastructure and capacities in Developing and Least Developed Countries in Africa.**

#### 4.9.11 Data Exchange (Ref. 4.5.3)

Survey responses indicate that substantial enhancements are needed to telecommunications, quality assurance and archiving systems and data processing capabilities in most of the NMHS in Africa. The identified deficiencies and limitations related to data exchange support requirements for **substantial investments in capacity development and sustained, long term, funding** for continuing operation and maintenance of data exchange systems.

#### 4.9.12 Forecast and Warning Capability (Ref. 4.5.4)

The respondents' strong recommendation for upgrading the expertise of professional staff is validated by the responses summarized earlier. In addition, however, the cited deficiencies in applications software and computer capability need to be addressed. Furthermore, the fact that several NMHSs in Africa do not have a warning and forecast capability and a larger number do not provide such services on a round the clock basis represent major deficiencies in relation to provision of effective support to disaster risk reduction. As with other aspects of NMHSs infrastructure and capacities, **enhancement of forecast and warning capacities in Developing and Least Developed African countries represent particularly high priorities.**

#### 4.9.13 Forecast and Warning Products (Ref. 4.5.5)

The respondents' recommendation regarding the need to improve their warning products and services is well-founded. In addition, however, the responses suggest that **greater emphasis may be needed on significant hazards such as forest and land fires** in some countries in Africa where aviation hazards appear to have taken priority.

#### 4.9.14 Coordination of Warnings (Ref. 4.5.6)

Respondents' strong recommendations for improved coordination with RSMCs and neighbouring NMHS in relation to watches and warnings is well supported. Such coordination reduces the risk of ambiguous or, in the worst case, conflicting warning messages from different sources reaching the same audience. A compounding issue here is the increased potential for confusion that arises when commercial or other entities also prepare and issue warnings of hydrometeorological hazards to the public at large. Survey responses drew attention to problems that arise when private companies issue warnings that may, or appear to, conflict with NMHS warnings. **As a general principle, therefore, it is desirable to work towards a situation where official warnings for hydrometeorological hazards emanate from a single recognized issuing authority within each country.** Ideally being prepared by NMHSs with the scientific and technical capacity to make such predictions, hydrometeorological warnings may, in some circumstances, benefit from assessment and interpretation by civil defense authorities as to their likely impacts before being relayed to local communities, perhaps accompanied by advice from the authorities on actions that people should take to minimize loss of life and property.

#### 4.9.15 Products and Services for Selected Socio-Economic Sectors (Ref. 4.5.6)

Experience around the globe demonstrates that the socio-economic sectors discussed earlier can benefit significantly from the incorporation of hydrometeorological information and products into their planning and decision-making processes. Sensible land-use planning to minimize risk of

flooding and other hazards, rational planning and engineering design of housing and other developments to withstand expected wind loads or heavy rains and other similar measures contribute to hardening societies and communities against disastrous hydrometeorological events. Equally, early warnings of severe events enable people to take avoidance or mitigating actions to prevent disasters. The survey responses illustrate that considerable room exists to **contribute significantly to disaster risk reduction by enhancing the provision of relevant products and services to these economic sectors in Africa.**

#### **4.9.16 Dissemination Systems and Target Audiences (Ref. 4.5.8)**

Reliable and timely dissemination of early warnings of hazards to stakeholders and the public at large is among the most useful services that NMHSs can provide in support of disaster risk reduction. Consequently, every effort should be made to ensure that warnings and other relevant products reach important target audiences. In the context of disaster risk reduction, national **Red Cross/Red Crescent Societies and similar non-government bodies should be targeted for receipt of hazard warnings** on virtually the same level as government disaster authorities. NMHSs should seek to encourage and support such bodies to access and utilize early warnings of hazards and other relevant NMHS products.

#### **4.9.17 Product Utility and Product Improvement (Ref. 4.5.9)**

The survey responses confirm that there is substantial room to improve the utility of hydrometeorological products in Africa. Overwhelmingly, they identify critical needs to enhance efforts to increase public and stakeholder awareness and understanding of hazards, watches, and warnings and how to react to them. The responses point to insufficient interaction with disaster authorities in almost half of the responding countries. In addition, **less than half of the reporting countries operate a quality control or verification/validation programme for warnings** yet such verification data are not only fundamental to achieving improvements in accuracy, timeliness, and utility of hazard warnings but can also be effective in demonstrating NMHSs capabilities, and improvements in these capabilities, to senior government officials, disaster risk agencies and international donors. The respondents' recommendation regarding the value of educational modules is consistent with the preceding analysis, albeit somewhat narrowly focussed on a single methodology.

#### **4.9.18 Internal NMHS Training and Capacity Enhancement (Ref. 4.5.10)**

The respondents' recommendations for upgrading of operational forecasting and warning capabilities and for cross-border operational training of forecasters are validated by the survey responses. However, they appear somewhat narrowly focussed in that the responses also indicate that a large percentage of NMHSs would benefit from **much closer collaboration with disaster risk authorities and emergency managers in developing and delivering internal training programmes** for NMHS staff and joint training programmes with disaster risk agencies.

#### **4.9.19 Outreach Activities (Ref. 4.5.11)**

The respondents' recommendation addresses the evident need to give much higher priority to outreach activities in most countries in Africa. Even the most timely and accurate early warnings of hydrometeorological hazards and related products for disaster risk reduction are of little value if the recipients are unable to understand them and do not know how to act on receipt of them. Equally, all survey responses stressed the value of joint training between NMHS staff, disaster authorities, emergency response agencies and media. It seems clear, therefore, that **continuing emphasis should be devoted to well-designed outreach activities** directed at key stakeholders and the public at large. The most effective and appropriate tools for outreach will vary with target audience and local circumstances. However, many examples of what may be considered best practices exist and these can be drawn upon through contacts with WMO and other NMHS.



#### 4.9.20 NMHS Contingency Planning (Ref. 4.5.12)

The survey responses confirm that many African NMHSs **do not have back-up arrangements in place to maintain hazard warnings and other critical services** in the event of disruption of their operations. This represents a critical deficiency in the context of provision of hydrometeorological support to disaster risk reduction authorities. The establishment of partnership agreements with neighbouring NMHS to provide back-up capabilities can be an effective and low-cost approach to remedying this deficiency.

#### 4.9.21 WMO Support (Ref. 4.7)

African respondents to the survey, probably not surprisingly, identified their highest priority needs for support from WMO as being in **capacity building and infrastructure development areas and in resource mobilization**. Many of the identified needs are in areas that have been the traditional focus of WMO scientific and technical development, training and outreach programmes. However, some new requirements for support related to disaster risk reduction have also been expressed. These include **hazard mapping, inputs to risk assessment tools and the development of national disaster risk reduction plans and**, as somewhat lower priorities, “softer” areas such as **visibility enhancement and strategic partnerships**. The issue of assistance in resource mobilization presents a major challenge, particularly since it involves two threads:

- The limited-duration injection, on a project basis, of resources to **upgrade infrastructure or conduct training programmes or demonstration projects**. WMO can sometimes assist in this area either through internal WMO or external donor funding.
- The parallel need in many African countries for **sustained long-term funding to maintain the round-the-clock operations** of their NMHS observation, telecommunication and informatics networks, warning and forecast production and dissemination systems and other operational components for the foreseeable future. The most realistic source of such long-term, continuing, funding is the responsible national governments.

#### 4.10 Region-wide Capacities and Resources

In contributing to disaster risk reduction at the country level, NMHS in Africa can draw upon and benefit from the expertise and capacities of capabilities of WMO global systems and of a variety of regional and sub-regional institutions and programmes. Seven WMO Regional Specialized Meteorological Centres (RSMCs) are located in Africa, at Algiers, Antananarivo, Cairo, Dakar, Lagos, Nairobi and Tunis/Casablanca, and these Centres support NMHS operational programmes through provision of guidance products and advice. Several other designated centres of expertise also supply relevant advice and services to NMHS. In particular, the African Centre of Meteorological Application for Development (ACMAD), IGAD Climate Prediction and Application Centre (ICPAC), SADC Drought Monitoring Centre (SADC-DMC) and the Tropical Cyclone Centre play important roles both as suppliers of products and services and as centres of expertise. Moreover, Regional Meteorological Training Centres in Algeria, Angola, Egypt, Kenya, Madagascar, Niger and Nigeria represent important training resources that can assist in strengthening NMHS capacities.

In the hydrological sphere, a number of regional initiatives are also underway aimed at building hydrological capacities within countries, enhancing hydrological observation networks on major basins, strengthening cooperation and promoting free exchange of hydrological data. These include the SADC-HYCOS in the Southern African Development Community, the Niger-HYCOS and Volta-HYCOS, IGAD-HYCOS, Congo-HYCOS, Lake Chad-HYCOS, Senegal-HYCOS and Med-HYCOS, all of which fall under the umbrella of the WMO World Hydrological Cycle Observing System (WHYCOS) programme. A further resource is UNESCO's International Hydrological Programme (IHP) that focuses on hydrological studies and training and education in the water sciences, with current emphasis on water resources management for sustainable development including adaptation to changing climate and environmental conditions. More broadly, the African Union (AU) and the New Partnership for Africa's Development (NEPAD), in collaboration with

various regional and international institutions, have developed the “Africa Regional Strategy for Disaster Risk Reduction”. In co-operation with Regional Economic Communities (RECs) in Africa, AU/NEPAD and the African Development Bank (ADB) will lead the process of developing the competence required for the implementation of the regional strategy. In this effort, they are being supported by the UNDP, International Strategy for Disaster Reduction (ISDR) and other development partners and donors and by specialized technical institutions such as WMO, UNESCO and EUMETSAT. A number of projects and activities of particular relevance are already underway or completed. Examples include projects to enhance the capacities of NMHSs to identify risks and generate sector specific products, educate users to interpret and apply climate information and products, the African Monsoon Multidisciplinary Analysis (AMMA) project to improve understanding and prediction of West African monsoons, and a training initiative to improve the satellite remote sensing capacities of NMHSs. These and other projects provide opportunities for NMHSs to strengthen their capacities to support disaster risk reduction by accessing support and expertise from well beyond their own national boundaries.