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Seasonal-to-decadal timescale

Deliverable D*41.1*

Review of the climate information products of the WMO RA VI RCC-network useful to the decision-maker

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Brief Description	*Review of the climate information products of the WMO RA VI RCC-network useful to the decision-maker: The relevance of the WMO RA VI RCC network to the Decision Making Process of various stakeholders. Input will be taken from WP 11.*	
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1. Executive Summary

WMO Regional Climate Centres (RCC) have a key-role for the provision of regional climate information products. Main recipients of such information are National Meteorological and Hydrological Services (NMHS) which process and tailor this information to develop climate information products for end-users on the national and local scale. For the development and dissemination of upcoming seasonal to decadal (S2D) climate service products in Europe, the RCC of the RA VI region is thus a potential institution which will provide basis information and data.

To assess the potential of the RCC of the RA VI region for disseminating climate information products and their impacts on variable end-users (stakeholders) the relevance of RCC products for boundary institutions, especially NMHSs, was assessed by an online-survey. The survey queried the characteristics and extent of products developed by NMHSs with respect to their sector-specificity and time-scales. Furthermore, the impact and relevance of RCC products for the own products development was queried. One product was highlighted, since this has special relevance for the EUPORIAS project: the Climate Watch Advisories and its use and relevance for NMHSs were therefore queried separately in the last part.

The results indicate a broad use of RCC products by NMHSs. And all RCC products are considered to have a minimum relevance for most of the NMHSs. However, RCC products are mostly used for the development of general climate information products and have minor relevance for the development of user- or sector-specific products. Remarkable exceptions are seasonal forecast products which are only used by a few NMHSs but which are used permanently and have high relevance for them. The potential use, however, is generally high. Climate Watch Advisories have a general relevance for all NMHSs and have a high potential use covering demanded time-scales as well as impact-related information relevant for sector- and user-specific climate information.

RCCs, as providers of regional climate information, may become key–institutions for laborious and capacity intensive tasks like seasonal forecast products. However, the pathway of regional climate service development and dissemination conditioned by RCC structures (top-down) may not provide the ideal sett-up for user- or sector-specific tailoring of climate information.

2. Project Objectives

With this deliverable, the project has contributed to the achievement of the following objectives (DOW, Section B1.1):

No.	Objective	Yes	No
1	Develop and deliver reliable and trusted impact prediction systems for a number of carefully selected case studies. These will provide working examples of end to end climate-to-impacts-decision making services operation on S2D timescales.		X
2	Assess and document key knowledge gaps and vulnerabilities of important sectors (e.g., water, energy, health, transport, agriculture, tourism), along with the needs of specific users within these sectors, through close collaboration with project stakeholders.		X
3	Develop a set of standard tools tailored to the needs of stakeholders for calibrating, downscaling, and modelling sector-specific impacts on S2D timescales.		X
4	Develop techniques to map the meteorological variables from the prediction systems provided by the WMO GPCs (two of which (Met Office and MeteoFrance) are partners in the project) into variables which are directly relevant to the needs of specific stakeholders.		X
5	Develop a knowledge-sharing protocol necessary to promote the use of these technologies. This will include making uncertain information fit into the decision support systems used by stakeholders to take decisions on the S2D horizon. This objective will place Europe at the forefront of the implementation of the GFCS, through the GFCS's ambitions to develop climate services research, a climate services information system and a user interface platform.		X
6	Assess and document the current marketability of climate services in Europe and demonstrate how climate services on S2D time horizons can be made useful to end users.	X	

3. Detailed Report

3.1. Introduction

The development of Climate Services and the use of the climate information for objective decision-making is one of the primary goals of the EUPORIAS project. Besides the technical quality of the products, climate services require an actual impact on decision-making process to be of any value. The impact of climate information on the decision-making processes and the methodologies to assess the value and risk for decision-making processes are the objects of investigation of this work package (WP41). Knowing the sector- (user-) specific needs and decision-making processes enables a respective tailoring of climate information to create sector- (user-) specific climate service products. However, in order to implement the requirements of the users in a climate service product, the structure and the pathways of climate service dissemination need to be known. Characteristics and functions of this infrastructure may have significant influence on the potential as well as limitations of sector- or user-specific tailoring of climate information.

Seasonal to decadal (S2D) climate information is generally available on a regional scale and it is often processed and provided by Regional Climate Centres (RCCs) to National Meteorological and Hydrological Services (NMHSs) who use this information for the creation of user- or sector-specific climate services on a national or local scale. However, some NMHSs, especially those who have sufficient technical and personal capacities, access seasonal predictions directly via internet and web portals. Nevertheless, with respect to S2D climate information NMHSs often take the role of intermediaries or boundary organisations. As a result from the user needs analysis (WP12) the main sources of weather and climate information for end-users and boundary organisations are the National Meteorological and Hydrological Services besides the internet and web portals (Dessai and Soares 2015). Thus, NMHSs do have a key role for climate information provision and thus their source of regional to global climate information.

Since the organizational structure of the dissemination by RCCs complicates the assessment of the relevance of RCC products for end-users, the relevance of these products for NMHSs was assessed by using an online-survey. This implies a supplement of the DOW which stipulates the relevance of the WMO RA VI RCC network to the Decision Making Process of various stakeholders. Input was supposed to be taken from WP 11 but instead all information will be taken from the survey and discussed in the context of the results of WP11 and WP12. The deliverable is delayed due to the delay of D11.2.

3.2. WMO RA VI Regional Climate Centre – background information

3.2.1. WMO Regional Climate Centres – concept and function

WMO Regional Climate Centres (RCC) are centres of excellence which generate and provide regional climate products for National Meteorological and Hydrological Services (NMHSs) who apply or refine them on a national scale. The scope of RCCs is to support NMHSs with the implementation and maintenance of climate services by the regionalization of global climate products and the provision of exclusive regional climate information products. The goal is to enhance the capacity building of NMHSs to develop best possible climate services on a national scale.

The basic idea of RCCs is to embrace the phenomena of climate change and climate variability which are multi-scale processes and go beyond the national borders. The concept of RCCs is to bridge the gap between global climate information and climate services provided on national and local scale by respective NMHSs. RCCs are supposed to enable NMHSs to create adequate climate service products to meet the challenge of climate change and variability and to enable national adaptation planning. Furthermore, RCCs shall provide the capacities for regional climate data management, climate monitoring and forecasting which require sufficient computer power, modelling capacities and expertise which might not be available for all NMHSs.

The functions of RCCs are fulfilled by the members (NMHSs) of the respective region. This can be done by a multifunctional centre or a group of centres performing climate-related activities in collaboration to fulfil the required tasks of an RCC. Each centre or group of centres which accepts the responsibility for one or several of the mandatory activities of a RCC is defined as a Node. Mandatory functions of a RCC are threefold and encompass operational activities for (i) Long Range Forecasts (LRF), (ii) Climate Monitoring and (iii) Data Services to support the first two nodes. Additional 'highly recommended' functions refer to 'Climate prediction and projections' (> 2 yrs.), 'non-operational data services', 'coordination functions', 'training and capacity building' as well as 'research and development' (WMO 2010).

3.2.2. WMO RA VI RCC-network – structure, function and data dissemination

The RA VI RCC is organized as a network whose different nodes are composed of consortia hosted by respective lead institutions. The structure of the RA VI RCC is in agreement with WMO and the network-members and in principle open and flexible to meet the requirements of the RA VI members. The RA VI RCC-Network serves 50 member institutions (Figure 1) and is coordinated by the German Meteorological Service (DWD). The RA VI RCC has finished its pilot phase and was designated as a fully operational RCC in 2013. It covers the three mandatory functions of a RCC comprising LRFs, Climate Monitoring and Climate Data Services. These three nodes are organized as follows:

I. **RCC Node on Long Range Forecasts (LRF)**: the LRF-node provides seasonal-to-inter-annual (S2I) forecasts based on products from Global Producing Centres (GPCs) and produces adequate regional and sub-regional products. Besides the forecasts the service encompasses information and data on model performance and verification, forecasts consistency as well as source data assessments and seasonal outlooks (see Table 1 for details). Members of the consortium are Météo France (co-lead), Roshydromet (Russia; co-lead) and the NMHSs from Norway (met.no), Serbia (RHMS) and Turkey (TSMS).
II. **RCC Node on Climate Monitoring (CM)**: the CM-node provides operational services to monitor the climate system. The service encompasses products on climate diagnostics (maps and bulletins), regional and sub-regional reference climatologies, a regional climate watch and climatological assessment of significant weather events (see Table 1 for details). Members of the consortium are the NMHSs from Germany (DWD, lead), Armenia (Armstatehydromet), Météo France, Netherlands (KNMI), Serbia (RHMS) and Turkey (TSMS).
III. **RCC Node on Climate Data (CD)**: the CD-node provides operational data services to support the two other nodes as well as climate modelling. The provided services encompass quality-controlled regional data sets and databases, services on

archiving and data rescue as well as guidance und tools for these services. Members of the consortium are the NMHSs from Netherlands (KNMI; lead), Météo France, Hungary (OMSZ), Serbia (RHMS), Sweden (SMHI) and Turkey (TSMS).

According the RCC implementation plan RCC products and services are supposed to be accessible on the internet. All information and products are freely available but some may require a user-ID and password in order to secure the interests of NMHSs and to monitor the use of products. Thus, the major users are the NMHSs of the region and neighbouring regions but also regional and international organisations (DWD 2015).

3.3. The survey on the relevance of the climate information products of the WMO RA VI RCC-network for NMHS's

3.3.1. Developing and disseminating the survey

The aim of the survey is to assess the relevance of the climate information products of the WMO RA VI RCC-network for the National Meteorological Hydrological Services (NMHS) of this network. The NMHSs of RA VI are the main users of RCC climate information products who use this information for climate service development for end-users on a national and local level. Despite most of the RCC climate information is openly available on the RCC-website, the organizational structure of RCC product dissemination does not allow an extensive and systematic assessment of the relevance of RCC-products directly for the end-users. For that reason, the target of the survey will be exclusively on the NMHSs.

The relevance of the climate information products of the WMO RA VI RCC-network was not queried for each individual product but for product groups to maintain the practical handling of the survey. The classification of the product groups occurred in close agreement with the network partners especially Météo-France and Roshydromet (Russia) of the three specific RA VI RCC nodes: Climate Monitoring (CM), Climate Data Service (CD) and Long-range forecasting (LRF) (Table 1). In contrast, the Climate Watch Advisory (CWA) was queried individually since this climate service product is in the focus of the EUPORIAS project and a sector-specific Climate Watch prototype is supposed to be developed in WP 42. A second focus was supposed to be on the Climate Knowledge Data Base (CKDB); however this product is not yet in operational mode and can thus not yet be used by network partners.

Table 1: product-groups for climate information products provided by WMO RA VI RCC (grey coloured was not queried in the survey)

Node	Product group	Products
RCC-node CM	Monthly and annual bulletins	Annual Bulletin on the climate in RA VI; Monthly Climate Diagnostics Bulletin;
RCC-node CM	Significant weather events	Monthly event calendar; Monthly event maps; National and European reports; Historic Extreme Weather Events (reports, European Severe Weather Database (ESWD))
RCC-node CM	Parameter maps: Europe	Monthly, seasonal and annual maps of standard parameters and GCOS variables for the entire region; Reference climatology for standard climate parameters and indices
RCC-node CM	Parameter maps: individual countries	Monthly, seasonal and annual maps of standard parameters and GCOS variables for individual countries
RCC-node CM	Sub-regional products	Monthly, seasonal and annual maps of standard parameters and GCOS variables for the Eastern Mediterranean and South Caucasus region; SE Europe climate anomalies and extremes
RCC-node CM	Climate Watch Advisory	Advisory bulletins for upcoming climate extreme events
RCC-node CM	ECAD Indices-of-extremes: products	ECA/D based maps, graphs and trends (temperature, precipitation, extremes Indices; climatologies), based on station data or gridded data
RCC-node CM	Large scale circulation monitoring	Frequency anomaly of North-Atlantic regimes; Oceanic Plumes; Anomalies maps on different areas for: temperature, geopotential height, pressure
RCC-node CD	ECAD Indices-of-extremes: data	Gridded and station data sets
RCC-node CD	Data management tools	Tools for accessing and handling climate data
RCC-node LRF	Seasonal forecast products	Forecast maps; Land Boxes forecasts; Seasonal Outlook and Global Climate Bulletin
RCC-node LRF	Seasonal forecast scoring and verification products	Graphs and maps of model performances; Follow-up of the quality of operational previous forecasts;
RCC-node LRF	Digitized data on seasonal forecasts and hindcasts	Verification datasets

The survey consists of four sections with altogether 24 questions. Section A queries general information on the NMHS, the participant and its role within the NMHS. Section B retrieves information on the characteristics and spectrum of products and services provided by the specific NMHS or department within the NMHS. Section C aims for the use of climate information products of the WMO RA VI RCC by the respective NHMS (or department) and also queries the limitations and potentials of those products. Section D focuses on the use of Climate Watch Advisories as well as for limitations and potentials.

The survey was provided as an online-survey and invitations were sent to all NMHSs of the RA VI region. Invitation-letters were sent directly to the director of each NMHS with the request to forward it to people within the NMHS who are able to answer the questions. This dissemination process is due to the experience that people in general management positions do not have the detailed knowledge on the daily business within the individual departments and units. Furthermore, reflux from specific departments or divisions with different thematic background can be expected which provides more detailed information on the use of RCC climate information products and reflects a greater spectrum of use. Consequently, the total amount of survey participants may also exceed the number of NMHSs in the RA VI region due to a potential multiple feedback of each NMHS. On the other hand, the survey results may underestimate the use of RCC climate information products since the dissemination procedure does not guarantee a comprehensive coverage of all (potential) users of RCC-products within the NHMS of the RA VI region. Thus, the presented results represent the lower limit of the institutional use of RCC climate information products.

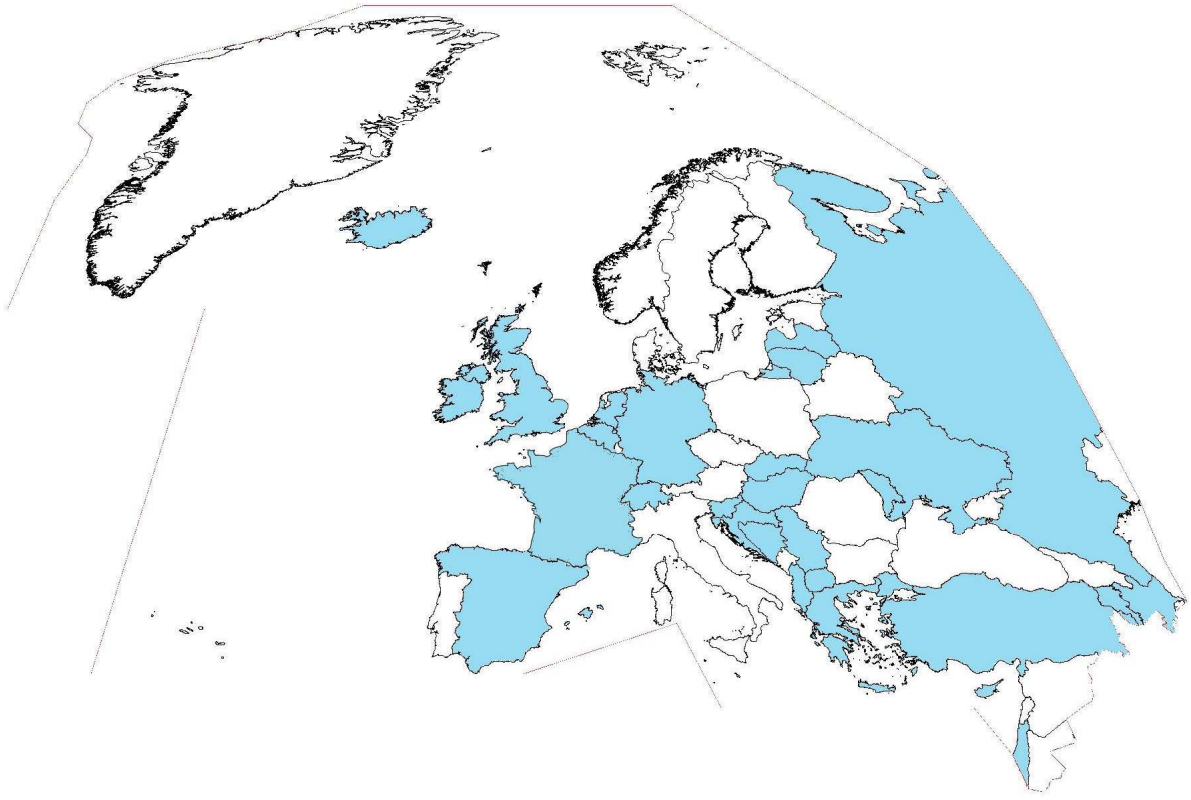

Figure 1: WMO RA VI region. Countries of responding NMHSs are coloured in blue. Not shown is the NMHS of ZA (South Africa) since this respondents is not part of the RA VI region

3.3.2. Analysis of the survey responses

Section A: general information

In the first section general information on the responding institution was queried. Focus was put on the country, size of the institution, thematic focus and position of the respondents. Within the region of RA VI there are 50 National Meteorological and Hydrological Services[1]. This results in maximum number of 50 possible feedbacks from different NMHS.

The total feedback on this survey is n=32 with a participation of NMHS from 29 different countries. One country (Russia) was represented by three different responding departments and one country (UK) by two. Additionally, one non-member of the RA VI area did participate (ZA). Two of the respondents could be identified as non-NMHS associated department and for another three respondents this association was not totally clear. Considering the non-NMHS respondents as well as one double-participation, this leads to a feedback rate of 52% (58%) of all RA VI NMHS. The participating countries are visualized in Figure 1.

NMHS of all size did participate at which, however, the smaller NMHSs with up to 250 employees (37%) and the moderate small NMHSs with up to 500 employees (22%) make together more than the half (59%). The moderate big NMHSs (500-1000 employees) are almost not existent (3%). The big NMHSs with more than 1000 employees (38%) however are again well represented (Figure 2).

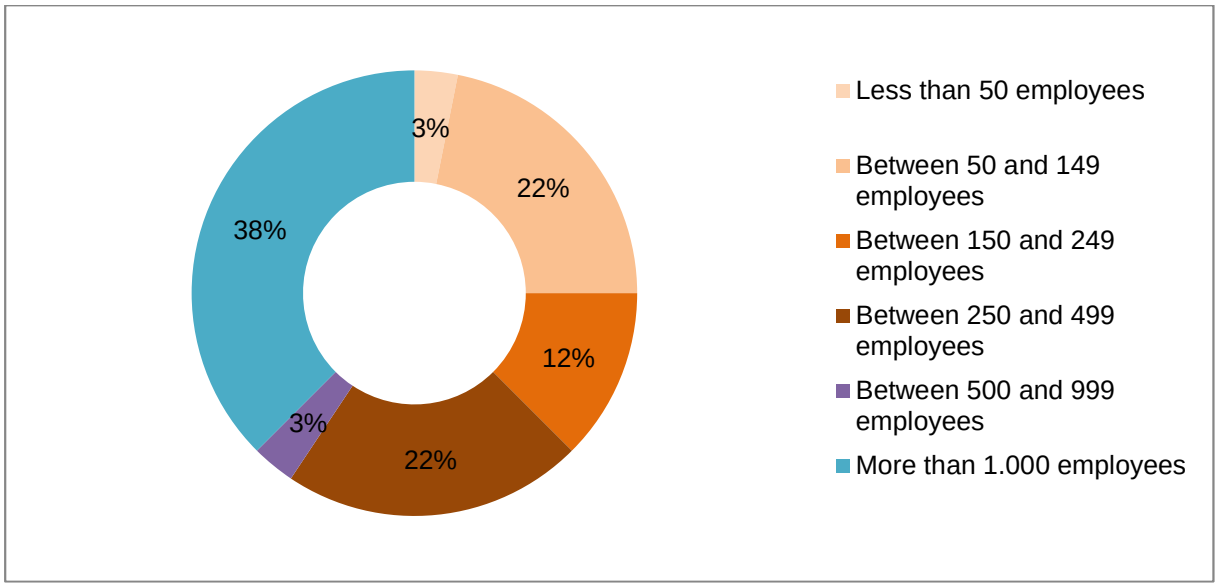

Figure 2: Number of employees of participating NMHS's

The majority of feedbacks came from members of specific departments within a NMHS. Around 84% of the feedbacks can be allocated to a specific department, unit, section or division of a NHMS. Only 10% of the respondents replied on the behalf of the entire NMHS or did not give any further details. Around 6% are not part of a NMHS (e.g. ministries or research centres) (Figure 3).

[1] http://www.wmo.int/pages/members/region6_en.html

The position of the respondents were mainly ‘heads of units’ (44%) which make together with ‘scientists’ (19%) and ‘managing scientists’ (6%) around 70%. ‘Directors’ and ‘deputy directors’ cover around 25% (Figure 4).

The classification of hierarchy roughly reflects the degree of specification of the responding institution. Many of the institutions have a general meteorological focus with common foci like climatology (43%), meteorology (14%) or hydrometeorology (14%) which altogether make a majority of 71%. Around 29% of the institutions do have a more specific orientation like ‘weather forecast’ (7%) and ‘warnings and emergencies’ (7%) or more general specifications like ‘research’ (11%) or ‘geophysical observation’ (4%) (Figure 5).

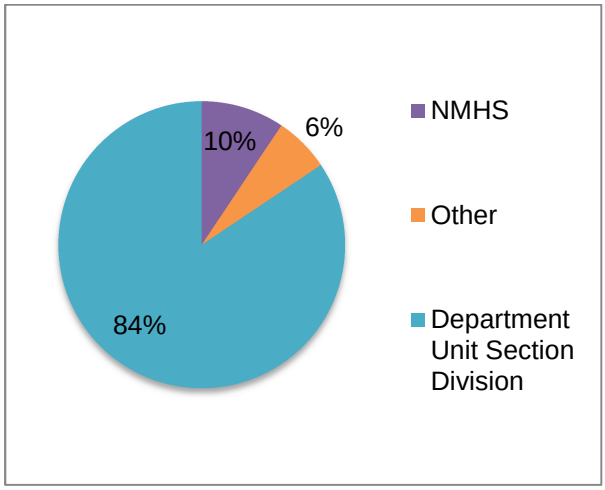

Figure 3: Institutional level of respondents

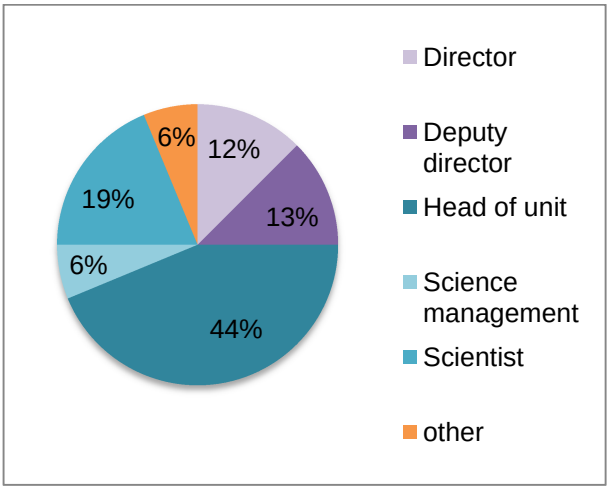

Figure 4: positions of the respondents within their NMHS

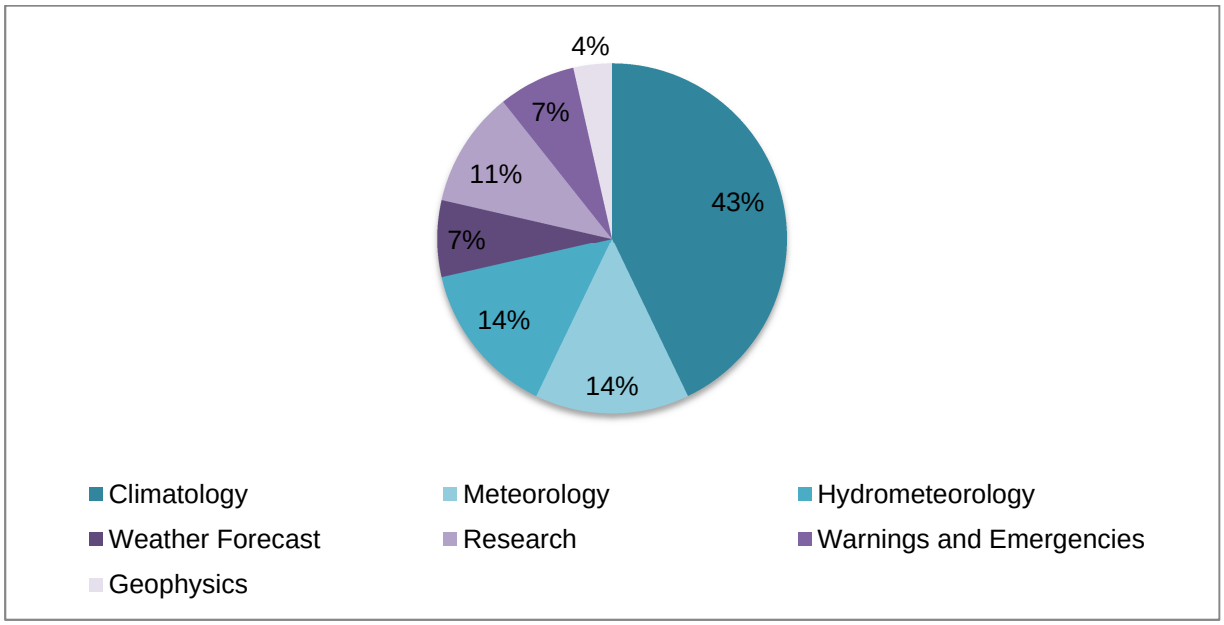

Figure 5: Thematic focus of department / section / unit / division of responding NMHS

Section B: products and services

In the second section the range of products provided by the specific institute or department was queried and especially their sector-specificity, time scales, scope of application and factors relevant for product development.

Sector-specific provision of climate information: For the most sectors rather general products are provided by the responding department which may be applicable for a specific sector. This is basically true for all sectors with a mean of 44% of all responses for each sector. Sector-specific products are provided predominantly for the energy sector and water sector (each ~50%) but also for emergency services (~35%), transport (~30%) and agriculture (~30%). However, explicit tailored products are also provided to a limited extent for finance and insurance sector (~25%), forestry (~20%), health (~15%) and the least but still for tourism (10%) (Figure 6). In general, no sector is significantly under-represented with respect to climate information products provided either exclusively or applicable. However, products for the water-and energy-sector slightly dominate. The reason for that cannot be identified but the economic relevance of these sectors may be important but also sector-specific needs or usability of such products.

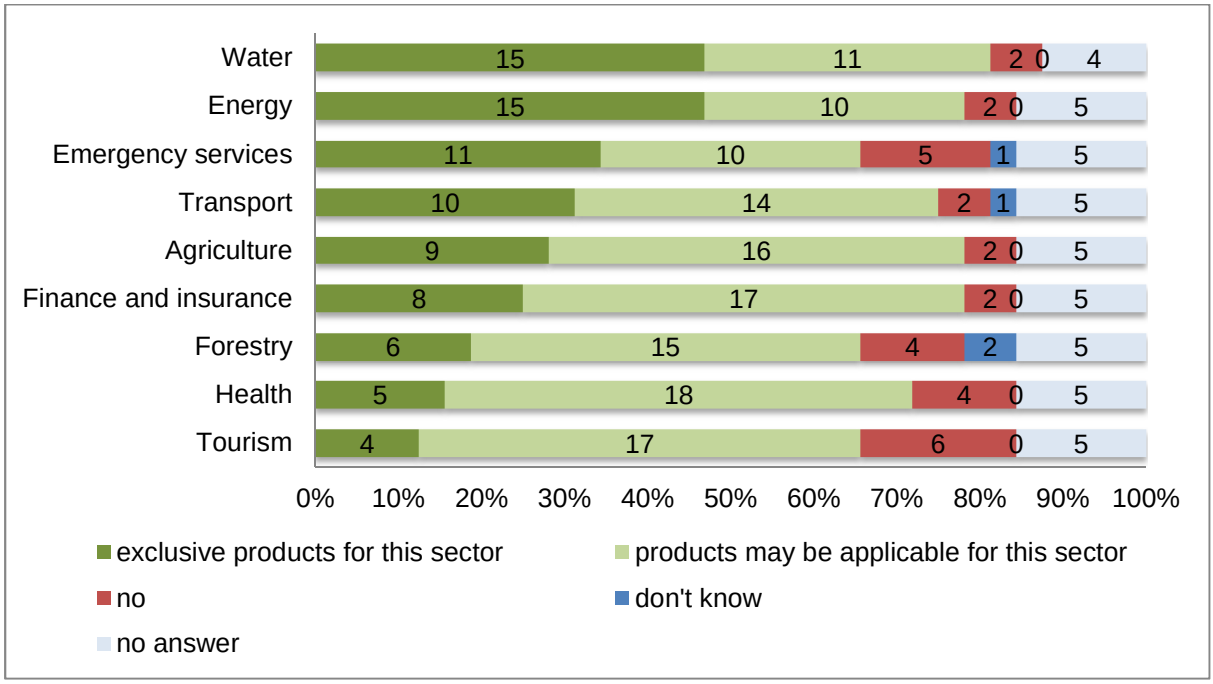

Figure 6: sector-specificity of climate information products provided by NHMS's of the RA VI RCC.

Time-scales of provided climate service products: beside the sector-specificity the time-scales of the developed climate-information products is of interest. Here, it was distinguished between climatological products and forecast products. With respect to climatology, products at time-scales of below one month and up to six months are produced by up to 80% of the responding NMHS. Also products with time-scales of more than 10 years are in common (~70%). The intermediate time-scales are less represented but they are still considered by almost 60% of all responding NMHS. The forecast products show a similar distribution whereat the total numbers of feedback is smaller: products with shorter time-scale (1-6 months) are developed by around 60% of the respondents and long-term products (> 10 years) by only 40%. For the intermediate time-scales, there is an even more significant gap of products which are only produced by ~10% (6-12 months) and 15% (1-10 years) (Figure

7). Product time-scales mentioned in 'others' generally refer to multi-decadal climatological products as well as future scenarios.

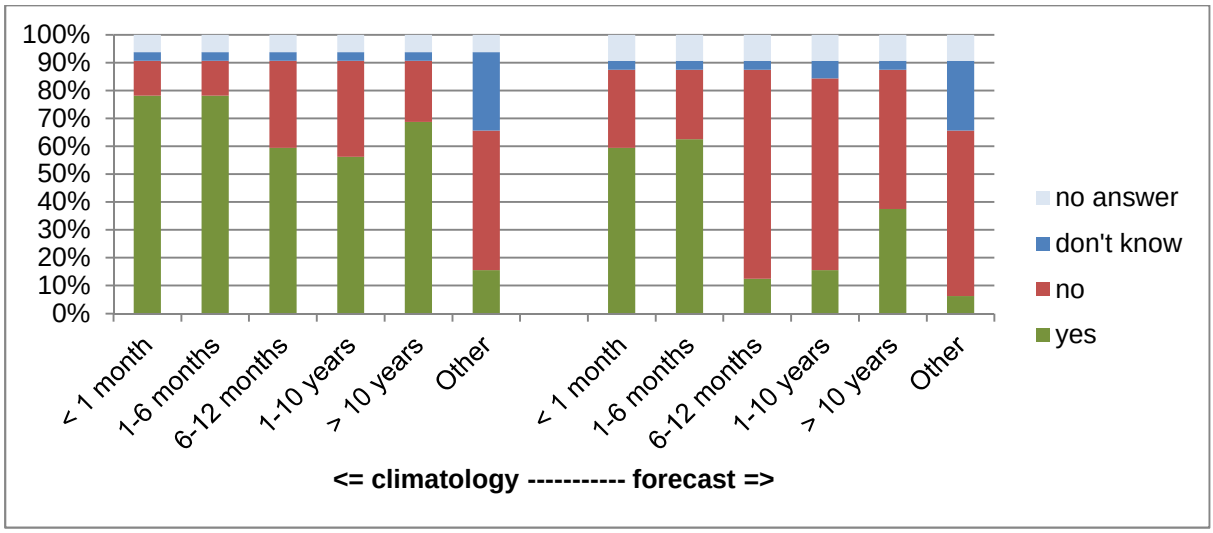

Figure 7: time-scales for climate-information products. Left: climatology products; right: forecast products.

Scope of application for climate information products: referring to the scope of application of the products it should be clarified if the format is rather aligned to individual user-needs, specific applications (but user independent) or not tailored but for general use and post-processing. Here it was distinguished between institutional and private clients. Analysing the results it can be stated that none of the suggested scopes does dominate. 'User-specific tailored products'[2], 'application-specific products'[3] as well as 'general climate products'[4] and 'products with no direct application'[5] are more or less equally represented within the product catalogue of RA VI NMHSs' considering a full or partly application of the given categories (75-80%). However, considering products for institutional clients 'general climate products slightly dominate' with respect to the category 'fully applies' (~60%) closely followed by 'user-specific tailored products' (~50%). The results for private clients look similar but the scope of these products is less clear defined. One exception however are 'products with no direct application' which are slightly under-represented for private clients (~50%) (Figure 8). The few specifications for 'other scopes of application' made by the respondents refer to products for the general public, (e.g. learning material, communication of climate change) and to international exchange and collaboration (WMO, IPCC, UN, EU, etc.) as well as research and development.

[2] Products developed based on user request
[3] Products developed for specific applications but not for individual users
[4] Products for scientific use, monitoring and further processing
[5] For reference, validation, general interest

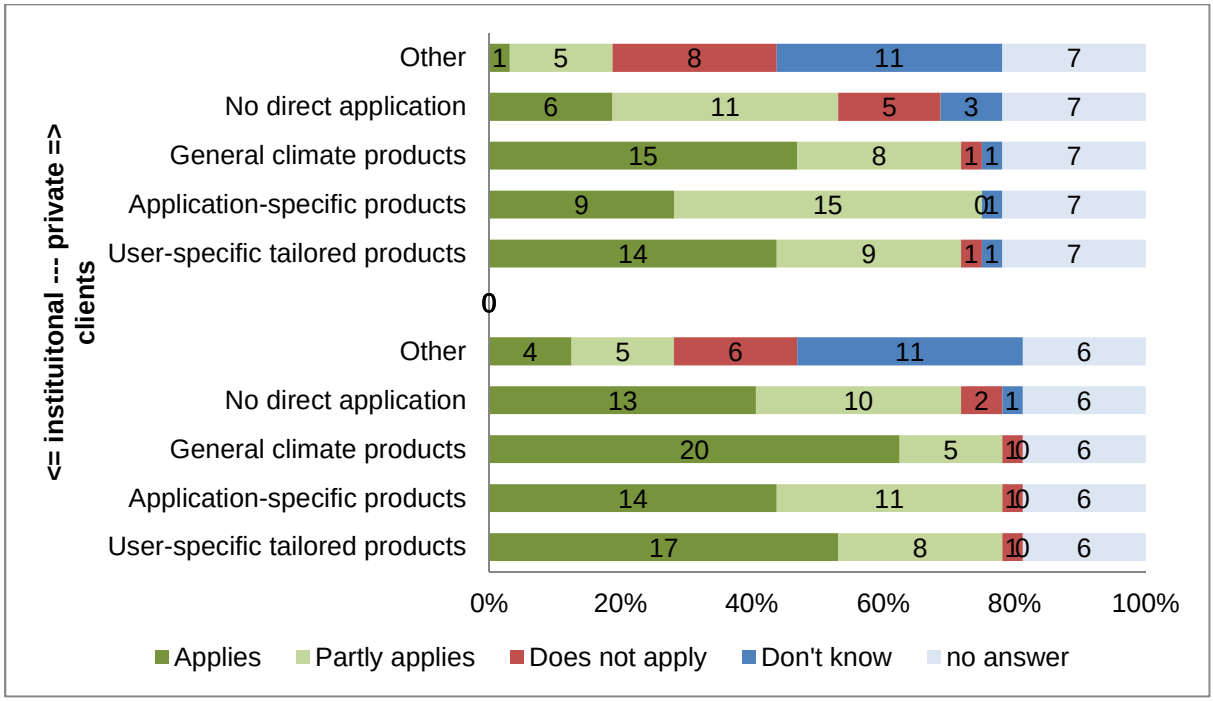

Figure 8: scope of application for climate information products differentiated between private clients (top) and institutional clients (down).

Factors underpinning the decision to develop a particular product: here again, it is differentiated between products for institutional and private clients. Looking at the highest priority ('applies in all content') of factors for institutional clients the results show that 'scientific standards' is an important basic factor (~40%) slightly more important than the other factors. However, as soon as priority-combinations are considered (here 'applies in all content' + 'frequent driver'), the factor of 'user needs and request' dominate (~80%) followed by sector-specific 'norms and regulations' (~65%), 'scientific standards' (~60%) and 'political interests' (~50%). For private clients the pattern is similar whereas 'user-needs and requests' dominate more clearly (70%) compared to the other factors: 'norms and regulations' (~45%), 'scientific standards' (~50%) and 'political interests' (~25%) which play here a rather minor role (Figure 9). As 'other' factors, international cooperation and exchange (see above) as well as common societal topics like climate change were mentioned. Furthermore, the initiative of scientific staff, managers and external people were named as well as the output from international and internal projects. Also the strategic program of individual NMHS is relevant.

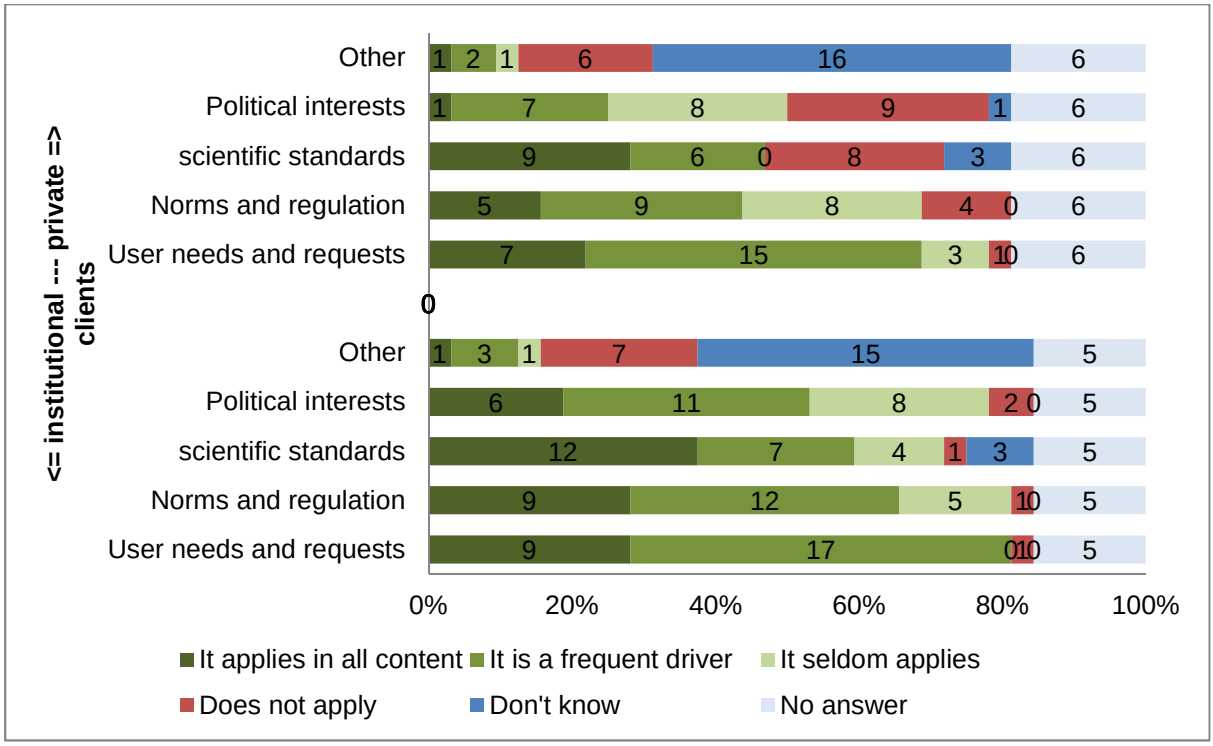

Figure 9: factors influencing product development. For private clients (top) and institutional clients (down).

Section C: use of RCC products

The third section queries the use of the climate information products by the individual NMHS or departments provided by the WMO RA VI RCC. It was asked for the specific product groups, their scope of application and relevance for the quality of developed products, reasons for limited or no use as well as aspects of potential usability. For the evaluation of question referring to the use-characteristics of RCC products only the feedbacks of respondents who actually use RCC products were considered. Specific figures are respectively marked.

Actual use of RCC products: RCC products are used or have been used at least once by 20 (62%) of the 32 respondents. 6 respondents (19%) did never use a RCC product, 1 (3%) respondent does not know and 5 respondents (16%) didn't give an answer (Figure 10).

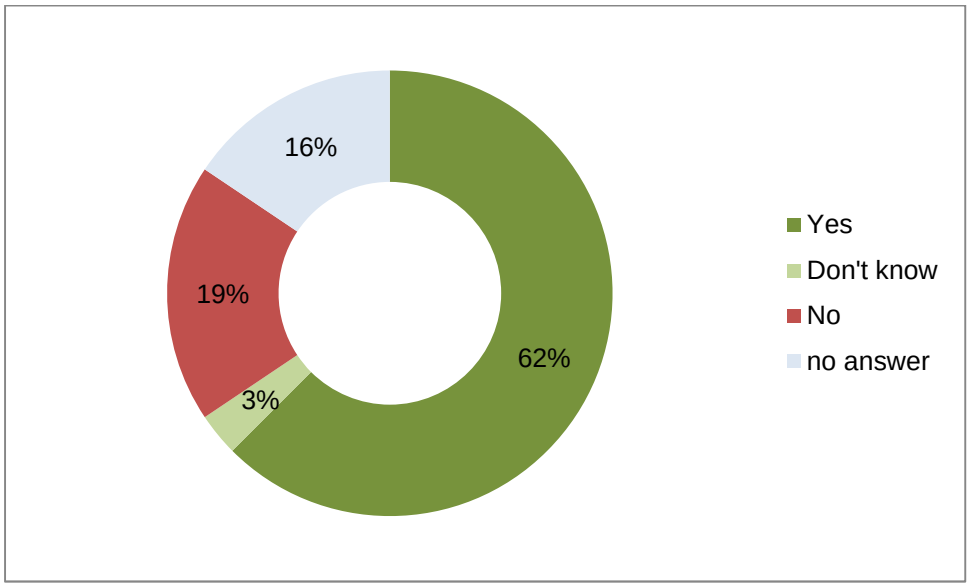

Figure 10: use of RCC climate information products by responding NMHS's.

Used RCC product-groups: The most RCC products quoted by the responding NMHS in terms of absolute use (no differentiation in frequency) are the 'monthly and annual bulletins' and products on 'significant weather events'. Both are used at least once by around 90% of the NMHSs (which use RCC products). Furthermore, the use of both product-groups were not excluded by any NMHS (never = 0%). However, they are closely followed by the ECAD indices-products (~85%) and data sets (~80%) as well as European parameter maps (each ~75%) and seasonal forecast products (~70%). But even the least used product group (digitized data on seasonal forecasts) was at least occasionally used by 40% of the NMHSs (Figure 11). Considering the frequency of use (only permanent and regular use) the 'monthly and annual bulletins' and 'ECAD indices products' are still within the top three (~50% and 45% respectively) but 'seasonal forecast products' gain importance (~45%). The importance of seasonal forecast products in general increases even more when only considering the category 'permanent'. They are then the three most quoted products (~25%), which means that some NMHS use them very regularly (Figure 12).

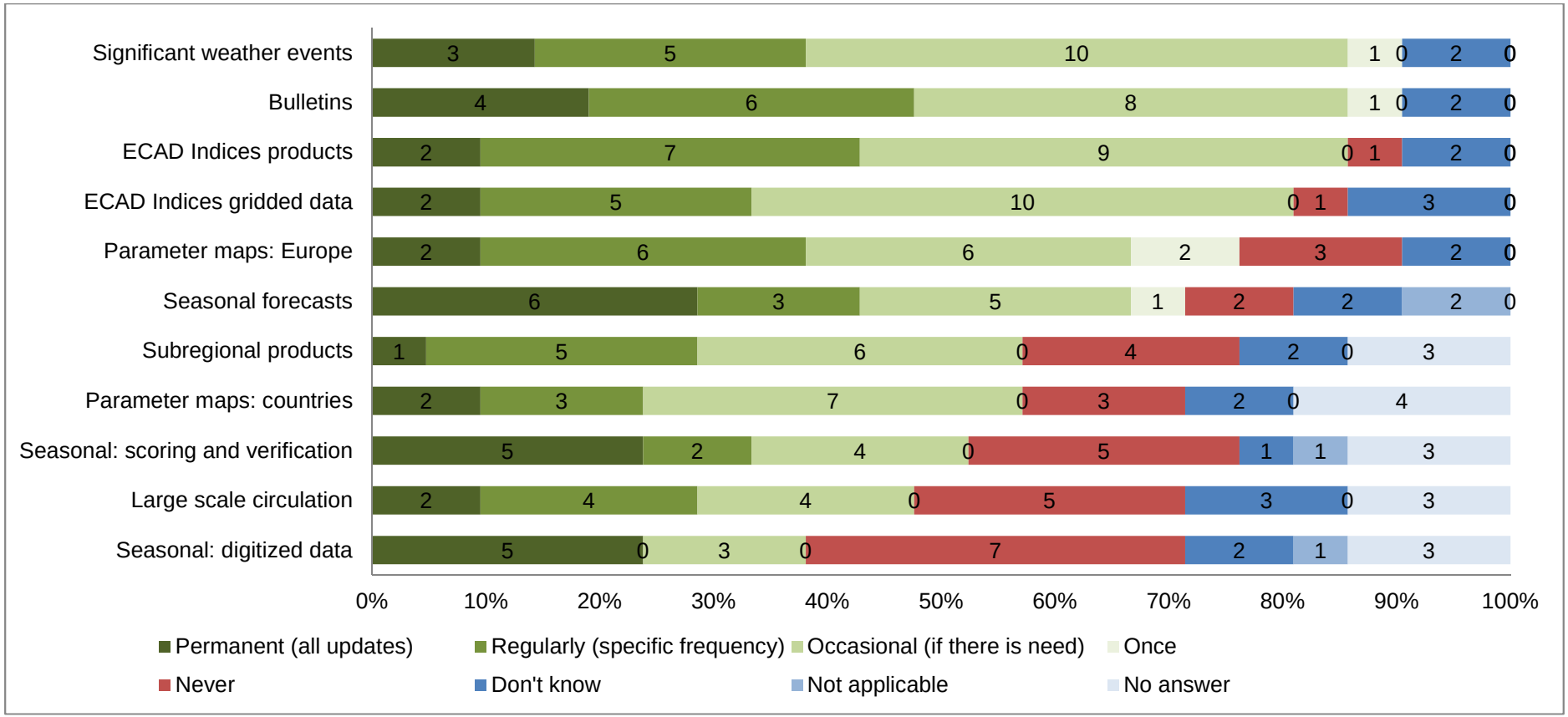

Figure 11: Overview on the use of specific product groups of RCC products by NHMSs' of the RA VI region. Only responses from users who actually use RCC products are considered (n=21).

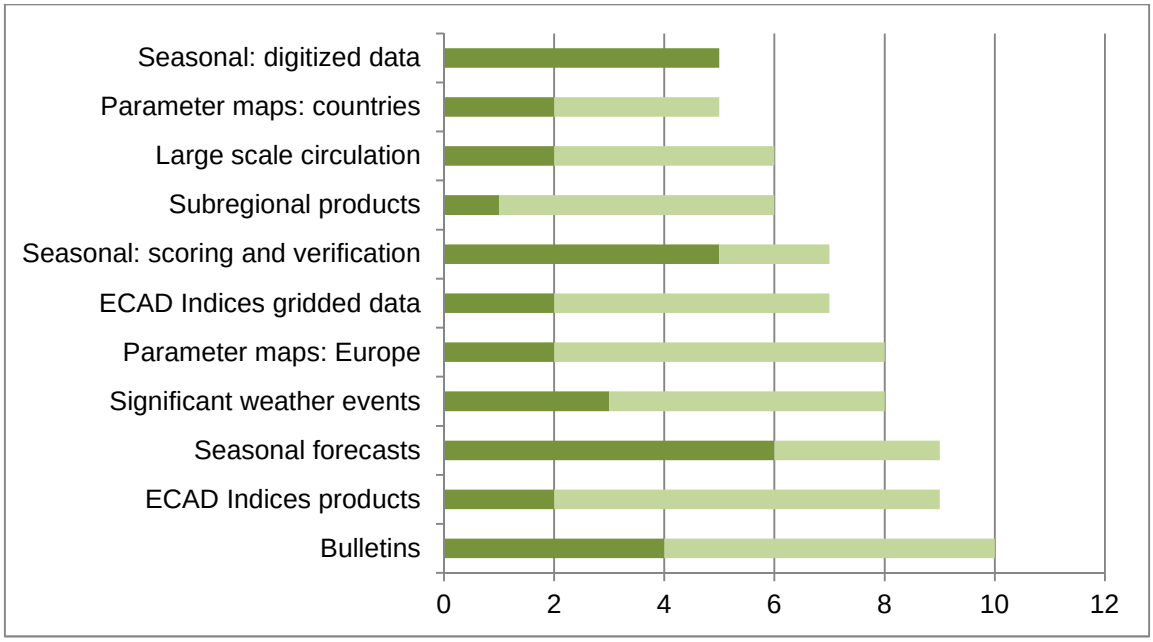

Figure 12: frequency of use of specific product-groups of RCC products by NHMS' of the RA VI region. Focus is on 'permanent use' and 'regular use'. Only responses from users who actually use RCC products are considered (n=21). For the legend please refer to Figure 10.

Scope of application of RCC products: The scope of application of products developed on the basis of RCC products was quoted. It was again differentiated between institutional and private clients. For institutional clients RCC products are predominantly used for the development of 'general climate products' ('Applies' + 'partly applies': ~65% ('Applies': ~25%)) or for 'products with no direct application' (60% (~25%)) showing a decreasing trend from rather general products to more specific products ('user-specific products': 50% (~10%)). For private clients RCC products play a less important role (e.g. 'general climate products' (~50% (~10%)). The decrease of generality from general to specific is similar, user-specific products (~40% (~10%)) are, however, relatively more important than for products for institutional clients (Figure 13). Other mentioned scopes are media, research and education as well as research and other projects.

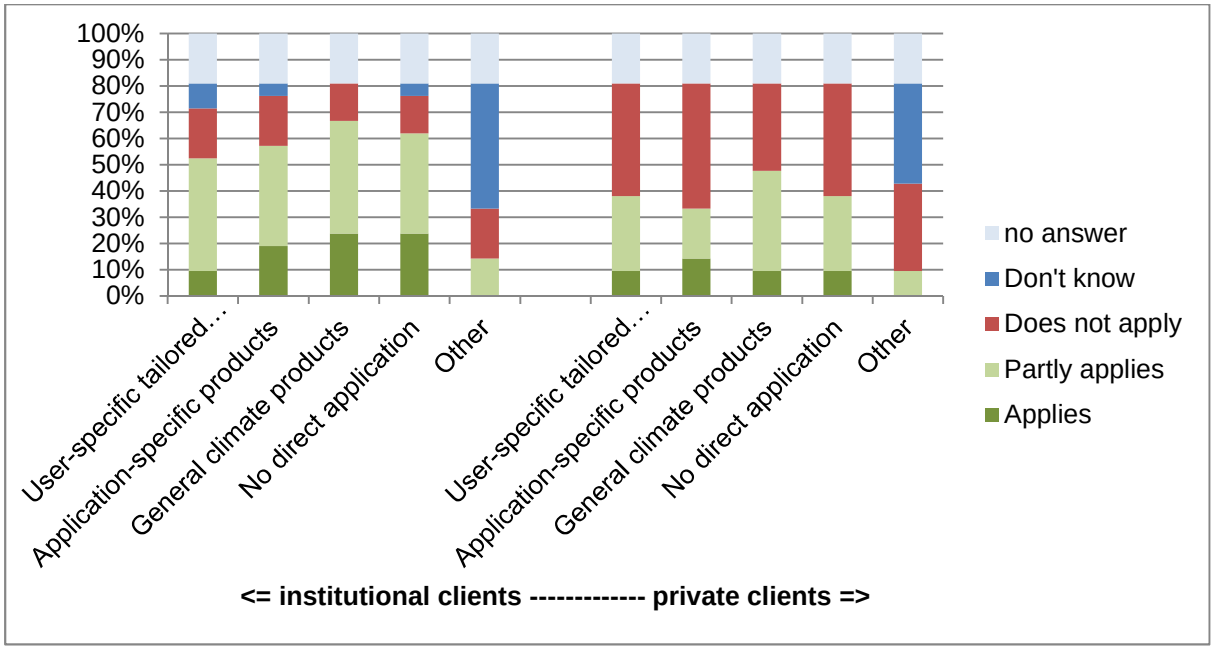

Figure 13: scope of application for NMHS' products developed on the basis of RCC products. Products for institutional clients (left) and private clients (right). Only responses from users who actually use RCC products are considered (n=21).

Relevance of RCC products for the quality of developed products: the specific relevance of RCC-products on the quality of products produced by responding institutions can be seen in Figure 14. The products which have any relevance (at least 'little relevance') are the predominantly 'ECAD indices products' (~85%), 'ECAD indices gridded data' and the 'monthly and annual bulletins' (each ~80%) and 'significant weather events products' (~75%), closely followed by 'seasonal forecast products' and parameter maps (both ~70%). At the lower end are the products on 'digitized data on seasonal fore- and hindcasts' which still have a least relevance for more than 40% of the respondents. However, considering exclusively the products which have a 'high relevance' it's the product group on seasonal forecasts which clearly dominates ('seasonal forecast products' (~40%); 'scoring and verification products' (~25%); 'digitized data' (~20%)) but also the 'monthly and annual bulletins' have relatively higher relevance (~20%) (Figure 14). The results are congruent to those in Figure 12: seasonal forecast products are used by only some of the NMHS but are of high relevance for those users.

Examples for end-user applications: whilst the relevance of the RCC-products on the quality of developed products by the NMHS can be identified quite well, most of the respondents don't know the specific examples for which their products have been used or will be used by the end-user. Only 10% (n=3) know an example, 31% answered with 'no' and another 31% answered with 'don't know' (or cannot explicitly relate the impact of RCC-products on final products) and 28% didn't give an answer at all (Figure 15). Specific examples given by the two respondents comprise the agricultural sector and the use of monthly and seasonal forecasts to predict the crop yield but also the public media which is not further specified.

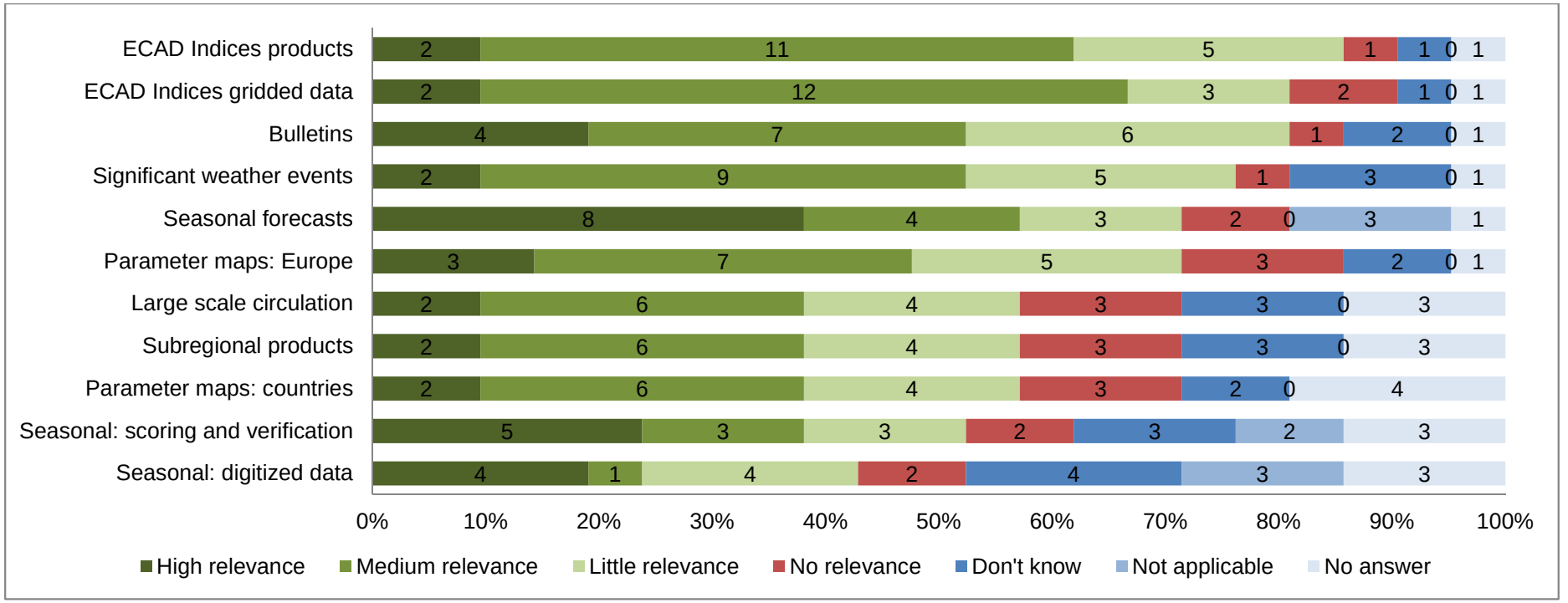

Figure 14: relevance of RCC products for the quality of climate information products developed by NMHSs. Only responses from users who actually use RCC products are considered (n=21).

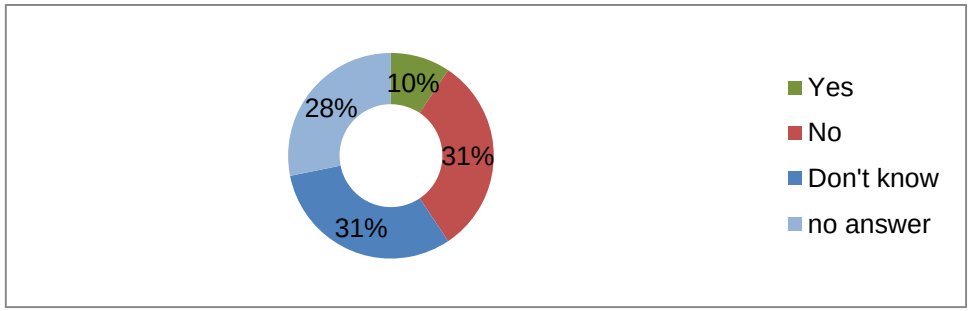

Figure 15: knowledge of specific example of end-user applications. Only responses from users who actually use RCC products are considered (n=21).

Reasons for limited or no use of RCC products: The respondents were asked for the reasons of limited or no use of RCC products. Here, again all respondents are considered (n=32). The main reasons for not using or a limited use of RCC products are predominantly that users 'don't know the product' (17%) or 'the use [of] other products instead' (17%). 'No need of RCC-products' was quoted in 12% of all cases and 'limited quality' and 'product specifications do not meet the users' needs' were only quoted in 6% (8%) of all cases. The main responses were 'other' (20%) (Figure 16). However, given comments on 'other' mostly did not further specify other reasons or pick up other issues. Since the two main reasons for not using or a limited use of RCC products are valid for actually all products the reason of 'no need of RCC products' is equally valid for 'subregional products', 'parameter maps' and the 'monthly and annual bulletins' (Figure 17).

Potential of (additional) application of RCC-products: the potential to apply RCC products is answered in 28% of all cases with 'yes' and in 33% of all cases with 'maybe'. An explicit 'no' was only answered in 4% of all cases. The rest (32%) falls into the category 'no answer', 'don't know' or 'not applicable' (Figure 18). All the RCC products have a high potential to be definitely or maybe used if the specifications would be different (> 50%). The highest potential of being used has the product group on 'seasonal forecast', 'the significant weather event products' but also the monthly and 'annual bulletins' (~70%) (Figure 19).

Requirements for existing RCC products to be of potential use: respondents could give details on requirements for the potential use of RCC products. The feedback rate was a mean of almost 7 responses per product group. Relevant comments for each product group are listed in Table 2. The majority of the comments relates to resolution and uncertainty/reliability/quality of the existing products. But also tailoring and format of output is relevant. Also additional products are desired. It is noteworthy that the most comments were made for the seasonal forecast product –group which is congruent to the feedback on their potential (see above).

Desired additional RCC products: additional products from the RCC are desired by NMHSs. Some are already mentioned in Table 2 (e.g. sub-regional products for northern Europe). Furthermore, general tools for data-processing and visualization are desired as well as Climate Watch for RA VI which is considered and analysed in the coming section. A further comment notes that much more effort is required to answer the questions of potential use properly.

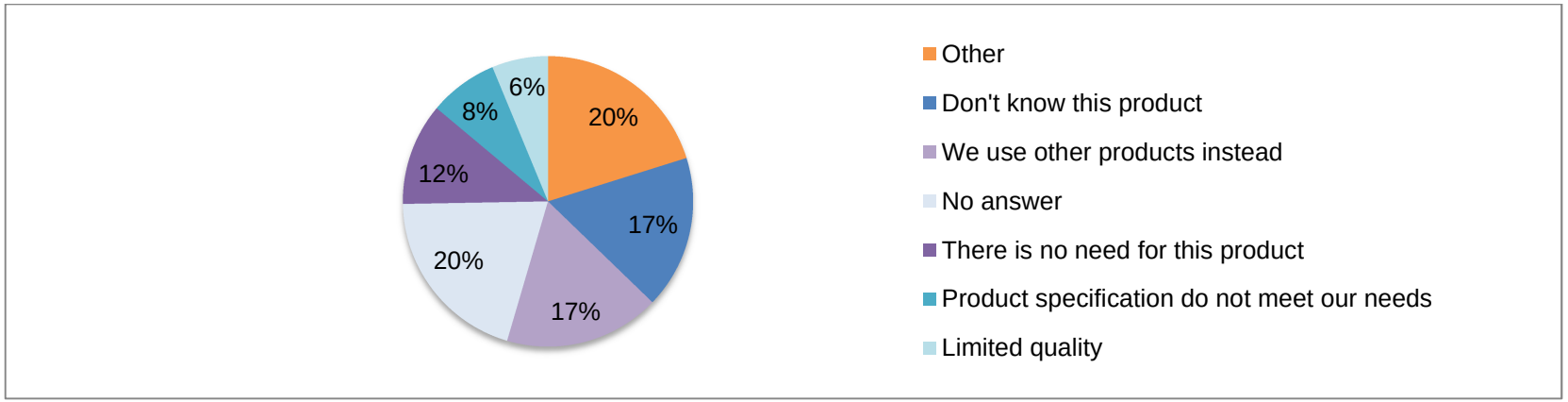

Figure 16: reasons for a limited or no use of RCC products: overview (n=32).

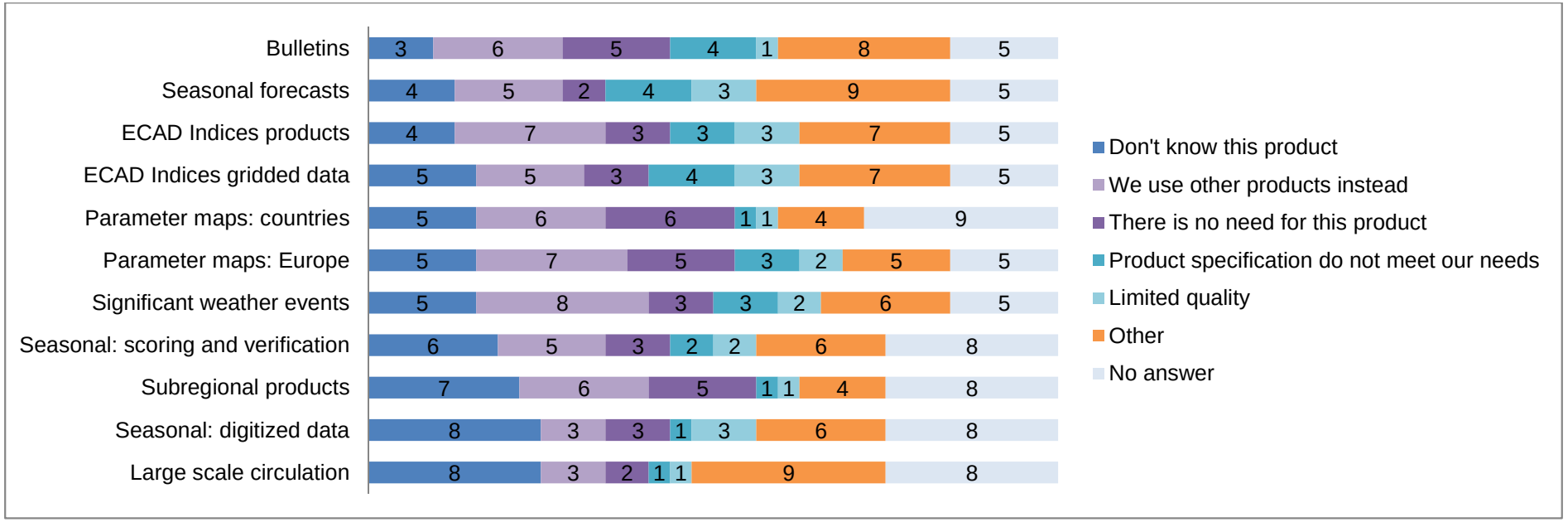

Figure 17: reasons for a limited or no use of RCC products for specific RCC product-group (n=32).

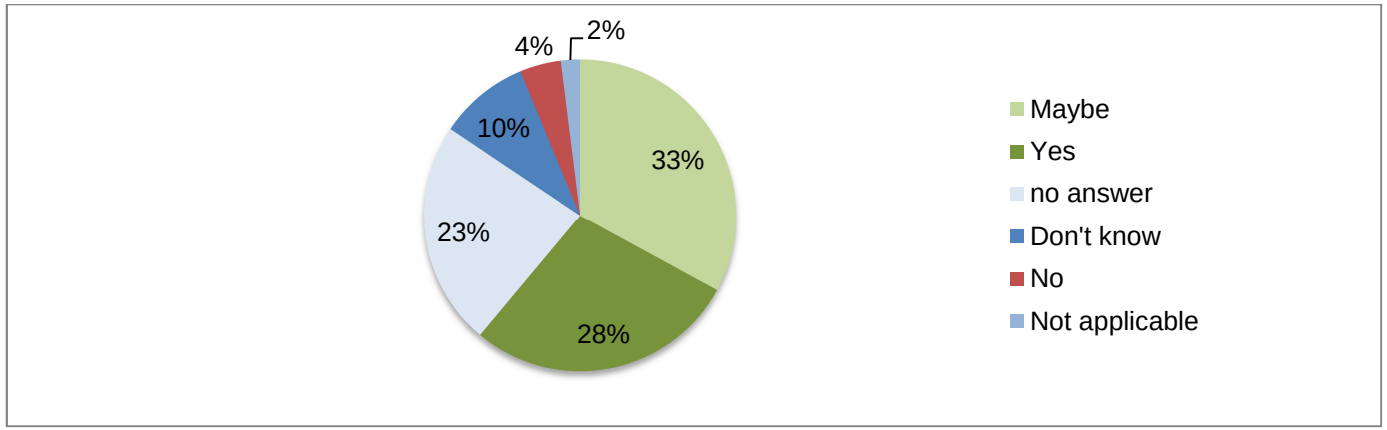

Figure 18: potential use of RCC products by NMHSs (n=32).

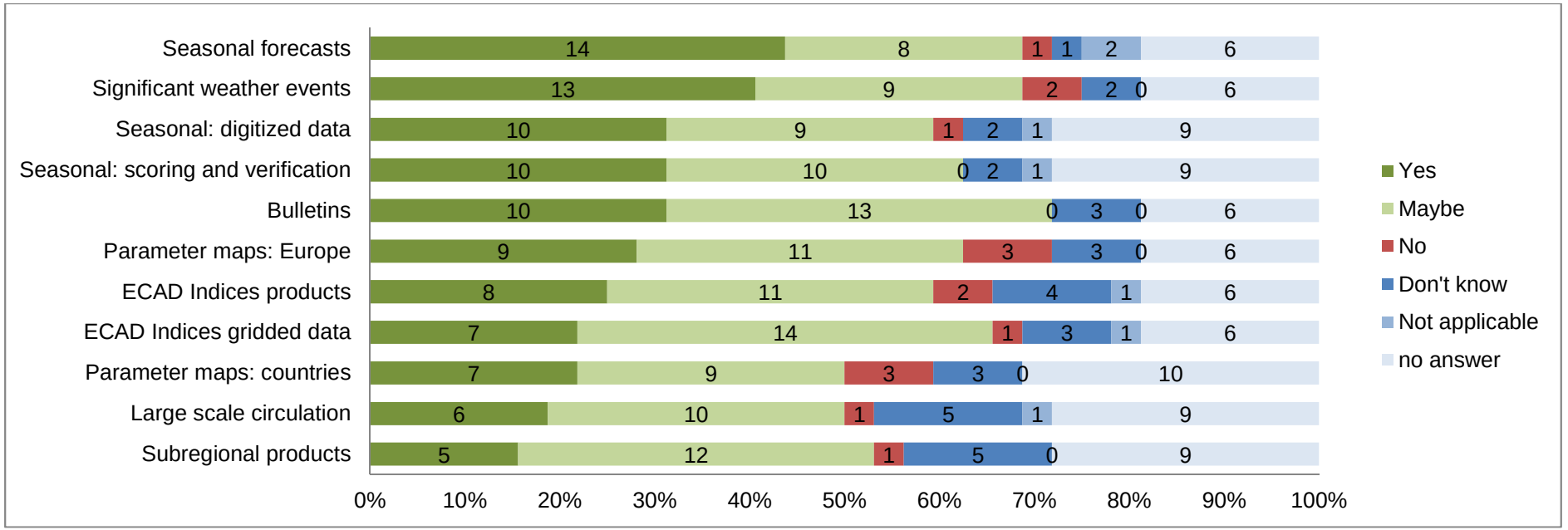

Figure 19: potential use of specific RCC products by NMHS (n=32).

Table 2: requirements for existing RCC-products to be of potential use for NMHS.

Product	Requirements
Monthly and annual bulletin	Detail, resolution; Earlier availability; More detailed circulation patterns
Significant weather events: maps, calendar and database	Detail, resolution
Parameter maps: Europe	Resolution; specific [other] parameters; Earlier availability
Parameter maps: individual countries	Need of more observation data; Specific [other] parameters; higher resolution; smaller uncertainty
Subregional products	Subregional products for other regions (e.g. northern Europe); Resolution; increased cooperation with SEEVCCC subregional center;
ECAD Indices-of-extremes products: maps, graphs, trends	Need of more observation data; based on larger datasets
ECAD Indices-of-extremes: gridded data sets	improved quality; larger and more extensive datasets
Large scale circulation monitoring	More and detailed information
Seasonal forecast products	Better formats for processing; Higher spatial resolution; No access to these products; Resolution, tailoring; Higher reliability; Availability of digital data sets;
Seasonal forecast scoring and verification products	Better formats for processing; Better model performance; No access to these products; higher quality Oceanic plumes rarely relevant for our location [Iceland] Verification skill score (ROCSS, RPSS, reliability diagrams, etc.)
Digitized data on seasonal forecast and hindcast	Better formats for processing; No access to these products; Full data availability

Section D: Climate Watch

In the last section the use and value of Climate Watch Advisories (CWA) was queried, since this is an elementary part of the EUPORIAS project and receives further consideration in other work packages.
Of the 32 responding NHMSs 37% (n=12) gave a positive feedback which means that they have already received CWAs in the past. Nine respondents answered with a definitive 'no' (28%) and the remaining 35% does not know or didn't give an answer (Figure 20). The information from the CWAs is used for two main purposes by responding institutions. These are: (i) additional information to support monitoring and general sub-regional forecasts at different temporal scales (n=7) and (ii) to issue (sector-) specific warnings, e.g. for weather events, climatic hazards (drought, floods, etc.) and agriculture (n=3). Two recipients of CWAs do not use this information.

The relevance of CWAs was assessed very differently by the respondents: 9% considered them as 'highly relevant', 13% as 'medium relevant' and 9% as 'little relevant'. However, almost all respondents agreed about any relevance of CWAs since only one negative feedback was given (Figure 21). In contrast, no examples were given for the actual use of CWAs.

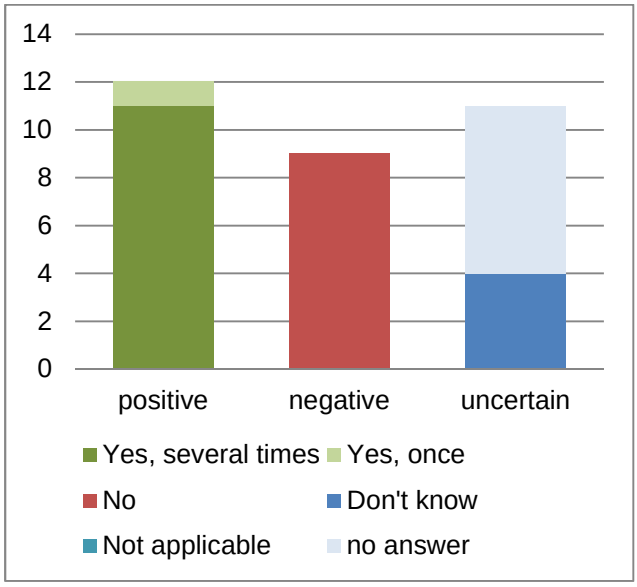

Figure 20: numbers of NMHSs which received a CWA in the past

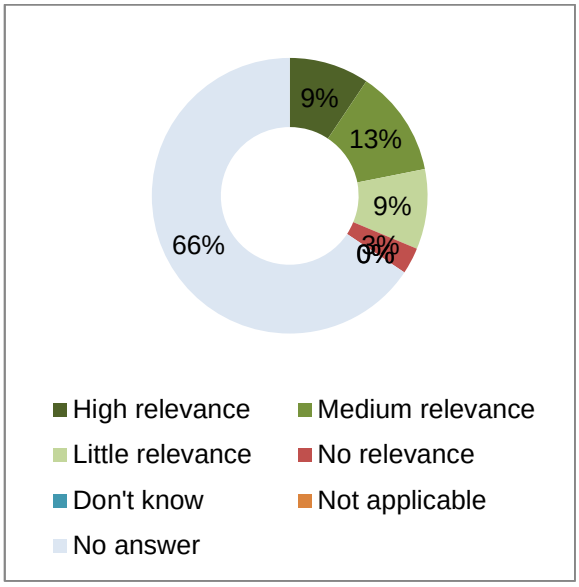

Figure 21: relevance of CWA's for the affected NMHSs.

Besides CWAs, around 50% of the questioned institutions use other early warning or climate forecast products. Only 25% negate the use of alternative early warning systems and 28% didn't give an answer or found this question not applicable (Figure 22). Alternative early warning or climate forecast systems which were mentioned are for instance ECMWF products (e.g. EFI) (n=5), seasonal forecasts from the APEC Climate Centre (APCC), NOAA (CPC), TCC Japan or products developed within the own NHMS. Short-term warning systems were also mentioned mostly 'meteoalarm' (by EUMETNET) (n=3) but also model data from 'Global Forecast System' (GFS), products form German Meteorological Service (DWD), 'HIgh Resolution Limited Area Model' (HIRLAM) and European Severe Weather Data Base (ESWD).

A reason for not using or a limited use of CWAs partly results from the use of alternative climate forecast or warning systems by NMHSs. But this makes only 16% of the answers. The main reason is that respondents do not know this product (25%) and 'other' reasons (22%). Further reasons like 'limited quality' (6%), 'product specifications do not meet the needs' (6%) and 'there is no need for this product' (3%) are mentioned but are of minor importance (Figure 23).

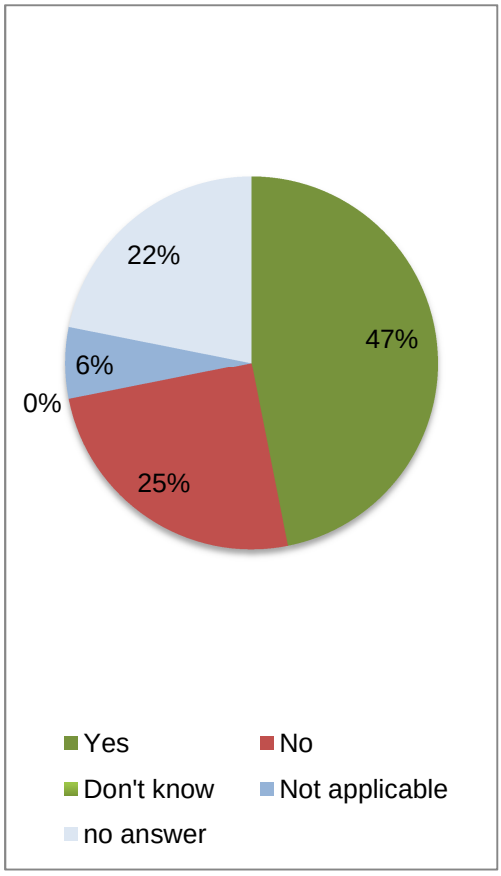

Figure 22: use of other climate forecast/warning systems.

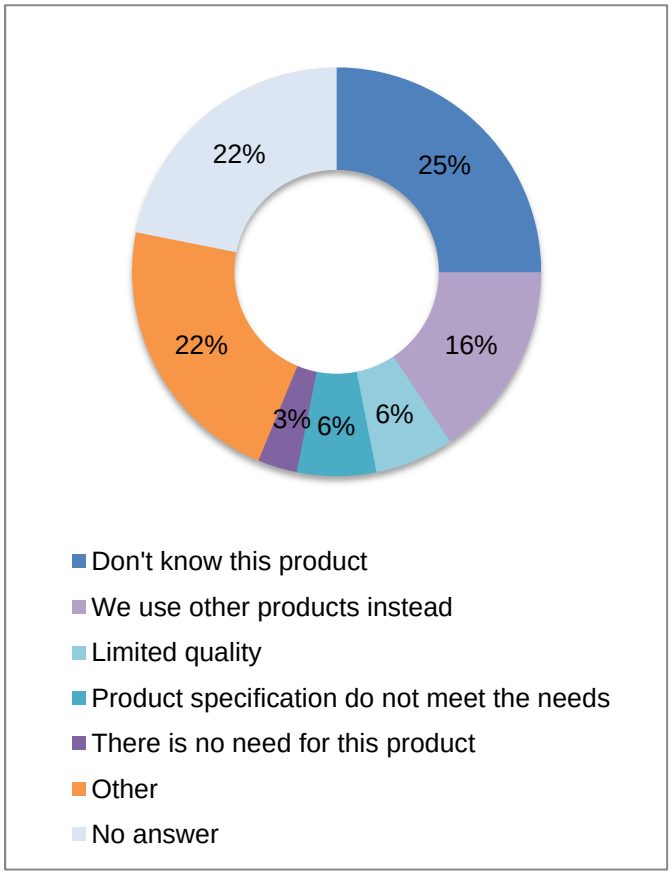

Figure 23: reasons for not using or a limited use of CWA

The potential use of CWA for product development of NMHSs was queried. This question refers to the conceptual character of this climate service product assuming further development with respect to current shortcomings of technical characteristics and information content. A potential use of CWA could be affirmed ('yes') by 24% and considered ('maybe') by further 36%. Only 12% could definitely exclude a potential use of such a climate service product. The remaining respondents do not know (20%) or didn't find this question applicable (12%) (Figure 24). The purpose for a potential use of CWAs, mentioned by respondents, could be user- and sector-specific climate information products (warnings), for drought and flood forecasting and warning and for climate research and analysis.

To be of potential use, CWA may have to be modified or optimized. As required specifications of CWAs to be of potential use, respondents mainly indicated the limited skill, accuracy and quality of this product. Furthermore higher or at least regular spatial

resolutions are desired with more local or sub-regional information. In contrast, CWAs are desired to rely more on climate data than on weather forecasts. Additionally, gridded data sets are desired for post-processing to develop sub-regional CWAs. But also the issue-timing of CWAs is desired to be earlier. More information content with respect to impact, temporal scales and sources is desired also by the use of indices like SPI and/or PDSI. In general information is desired which has value and is not available elsewhere. But also general access and guide/advice to seasonal forecasts products is desired and obviously not given by default to all NMHSs.

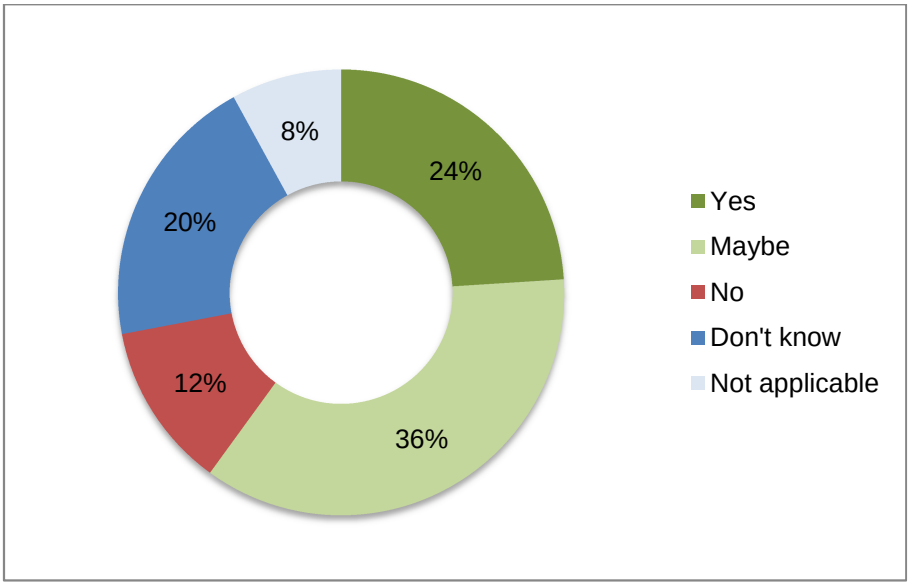

Figure 24: potential use of CWA

3.3.3. Discussion of results

Assessing the relevance of RCC products on the decision-making processes of different stakeholders is a difficult task since RCC products are mainly provided for NMHSs and seldom reach end-users directly. For that reason the relevance of RCC products for decision-making of NMHSs was assessed. Starting point of the discussion of results are the assumptions that

- RCC products may be relevant for NMHSs when they essential for the development of climate information products on the national or local level or at least provide additional value for product development.
- RCC products may be considered as relevant for end-users if this information is used by NMHSs to develop and produce sector- or user-specific climate information products.
- The structure of climate information provision and processing may have an impact on the potential use of climate services for end-users.

Relevance of RCC products for NMHSs

RCC products are broadly accepted by a majority of the NMHSs and users of the RA VI region. The products provided by the RCC seem to be relevant since they are equally used by around 70% of the responding institutions on average. Also the assessment of the relevance of RCC products for the products developed within an institution is relatively equal with a similar feedback rate of 70% on average. The most favoured products are also

considered as the most relevant which is to be expected. These are the monthly and annual bulletins, ECA/D indices products and related gridded data as well as products on severe weather events. Reasons for the prioritization were not queried and can therefore not be clearly identified. However, similarities of all product groups are the added value to basic (raw) climate information providing ready-to-use information which does not necessarily require post-processing which saves time and work-power. The information content is predominantly related to hazard-context of climate as well as the regional (Europe) context of past events. Products which are demanded to a lesser extent are mostly products with rather sub-regional relevance (e.g. sub-regional products and country-specific parameter maps and) or products which provide rather background information (e.g. large scale circulation monitoring, seasonal digitized data and seasonal scoring and verification products).

Of special interest are the products related to seasonal forecasts which are demanded by only a few NMHSs but which are used permanently (all up-dates) and assigned as highly relevant. This is congruent to the forecast products with temporal scales which are not provided by most NMHSs. Here, RCC products try to fill a gap of demanded climate information products which require climate information on a regional scale with national and local impact. This is also true for Climate Watch Advisories which belong to the same category and provide early warning on climate conditions on a seasonal scale and have any relevance for all responding users. The relevance for seasonal products becomes evident when looking at the potential use of RCC products at which seasonal products are desired the most besides products on severe weather events. Also referring to requirements for RCC products to be of potential use, specifications were predominantly made for seasonal forecast products. Of especial potential relevance are the Climate Watch Advisories which have a potential use of 60% which is the average potential use of a RCC product-group. This underpins the potential value of such a forecast product on a seasonal scale and also the value of ready-to-use hazard information.

However, the potential use of all RCC-products is generally high. This becomes evident either by the relative high positive feedback on potential usability but also by the reasons for a limited use or no use of RCC products: major reasons for not using RCC products are, ‘products are not known’ and ‘other similar products are used instead’. Thus, quality issues and products specifications are reasons for a currently limited or not existing use of RCC products. However, this does not exclude a potential use when specifications and quality change. This is also true for the Climate Watch Advisories. In this context the interpretation of the potential use becomes more evident: the potential use of CWAs is high but many NMHSs do use alternative products instead or additional. This is because CWAs are still of limited quality but also provide added value only to a limited extent to be considered as an exclusive valuable product. However, the lack of capacity (structural and staff) is also an important reason for a limited use of CWAs which should be considered.

Potential relevance of RCC products for end-users

The relevance of RCC products for various stakeholders is difficult to assess and can only be done based on indicators, since little is known about the actual use and impact of RCC-influenced products provided by NMHSs: only two respondents could give specifications on the actual use by the end-user. Most of the respondents didn’t know the usability for the end-user at all. The feedback for the use of CWAs by the end-user is even worse (no knowledge at all). However, information on the products and services provided by the NMHSs allow the

assessment of the potential use of RCC products. NMHSs provide specific climate information products for almost all sectors especially for the water- and energy-sector. But the majority of products are of rather general character which can be applied for specific sectors. This can also be observed in the scope of products (slightly dominated by 'general climate products' and 'user-specific tailored products') as well as in the factors relevant for decision-making on product development (slightly led by 'scientific standards', 'norms and regulation' and 'user-needs'). A top-down development of climate information products is indicated: general climate information is used for tailoring user- or sector-specific information. What seems to be trivial at first sight is elementary for the relevance of RCC-products for end-users, since RCC climate information is mostly provided to end-users via NMHSs and thus top-down per definition. Thus, user-needs are directed to NMHSs instead to the RCC directly. This structure of processing is consequently a prerequisite for the relevance assessment of RCC products for end-users.

Influence of climate information processing pathways on user needs

The scope of application of RCC products, however, tends to be rather for 'general climate products' and 'products with no direct application'. 'User-specific tailored products' are least produced on the basis of RCC-products. This is just tendentiously but observable and underpinned by the very little knowledge on usability of RCC-based products by the end-user. The cause for this could refer to the predominant use of short-term and local weather and climate forecasts by end-users due to quality reasons (Dessai and Soares 2015), which is not in the scope of RCC products. Information on climatology, which is often used by end-users, has often a general non sector-specific character. In contrast, there is basically a rather clear vision on the potential use of Climate Watch Advisories. The knowledge of the actual use by end-users is also limited but the potential use or purpose of such advisories has a clear sector- or problem-specific aspect: comments on the purpose of CWAs as well as specifications on requirements for CWAs mention sector-specific warnings and furthermore demand information on impact and further contextual information.

Regional Climate Centres as providers of regional climate service products can get a key role for the development and dissemination of S2D climate service products as they are developed within the EUPORIAS project. Information related to seasonal forecast is demanded by NMHSs and end-users but require specific technical and staff capacities to become available. These capacities are often not available for some NMHSs and can be provided by RCCs who have also access to the required global and regional climate and impact data. Especially databases like the European Severe Weather Database (ESWD) and the Climate Knowledge Database (CKD), which still has to get into an operational state, have a high (potential) relevance for climate information on a national and local scale but require central maintenance by an institution like a RCC. On the other hand, the structure of climate service processing and dissemination following the pathway of RCC – NMHS – end-user (top-down) challenges the sector- or user-specific tailoring of climate information which is already required in the choice of parameter and time-scale of (sub-) seasonal forecasts (Funk, Pouget et al. 2015).

3.3.4. Conclusion

Concluding the discussion on the results of the usability of RCC-products, it can be stated that RCC-products are broadly used by NMHSs and have at least a minimum relevance for all the users. However, there is a tendency that RCC-products are predominantly used for the development of rather general climate information products instead of user- or sector-

specific products. A remarkable exception are the products related to seasonal forecast which are used by only a few NMHSs but which are used permanently and have a very high relevance for the users. These products and especially the Climate Watch Advisories have a high potential for NMHSs and especially for user-specific applications. Thus, RCC products related to seasonal forecasts and products with specific hazard- and/or impact relation (e.g. ESWD and CKD) have a relative high (potential) relevance for users.

RCCs as providers of regional climate information may become key–institutions for laborious and capacity intensive tasks like desired seasonal forecast products. However, the pathway of regional climate service development and dissemination conditioned by RCC structures (top-down) may be challenging an optimal user- or sector-specific tailoring of climate information.

4. Lessons Learnt

To assess the relevance of RCC products for various stakeholders proved to be challenging due to the structure of processing and dissemination of regional climate information from RCC to the end-user. The connection between RCC climate information and decision-making processes of end-users is difficult to identify even for NHMSs as linking element. Such structures need to be considered for the development of an assessment concept and such structures do also have to be considered for operational dissemination plans of established Climate Services.

Furthermore, it proved to be difficult to identify the adequate contact person within a NMHS who is able to give answers on the use of RCC products. The applied method for survey dissemination tried to consider the position of the responding person to get as much detailed feedback as possible. However, using this method many potential users within individual NMHSs were probably not reached and valuable information is lost. Besides the survey concept a well-organized dissemination concept is important.

5. Links Built

Some findings from other Work Packages were used to discuss the results from the survey conducted in this deliverable including:

- sources of climate information for end-users as well as prioritized climate and weather products (WP12)
- implications of sector-specific vulnerabilities to climate variability for S2D climate information products (WP11)

The information collected and produced in this deliverable will be used to inform other EUPORIAS work packages, including:

- the development of a sector-specific Climate Watch prototype (WP42);

and may have potential use for

- the assessment of delivery tools of Climate Services (WP44)
- the assessment of Climate Services as a business opportunity (WP45)

6. References

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7. Appendix

7.1. Appendix 1: online survey

Use and relevance of WMO RA VI RCC climate information products for NMHS

The WMO Regional Climate Centre Network (RCC) for the greater area around EUROPE (RA VI) provides regional climate information products for its Member National Meteorological and Hydrological Services (NMHS). Considering issues related to climate variability and its related impacts, the relevance of climate information products which go beyond national boarders may become significant. Seasonal to decadal climate predictions may provide information on potential future conditions to organisations whose activities and operations are affected by weather and climate. NMHS's may be interested in providing appropriate sector-specific climate information for their customers.

Your participation on this short and confidential survey can help us to understand the current use and the potential usability of regional climate information products for the RA VI Region. Such findings will enhance our knowledge on the needs of NMHS's for such products and potentially improve the provision of regional climate information products for the RA VI Region for individual NMHS's like yours.

This survey is part of the EUPORIAS project funded by the European Commission.

There are 30 questions in this survey

Section A: General information

1 []

In which country is your National Meteorological and Hydrological Service (NMHS) located? *

Please choose **only one** of the following:

- ○ Albania
- ○ Armenia
- ○ Austria
- ○ Azerbaijan
- ○ Belarus
- ○ Belgium
- ○ Bosnia and Herzigovina
- ○ Bulgaria
- ○ Croatia
- ○ Cyprus
- ○ Czech Republic
- ○ Denmark
- ○ Estonia
- ○ Finland
- ○ France
- ○ Georgia
- ○ Germany
- ○ Greece
- ○ Hungary
- ○ Iceland
- ○ Ireland
- ○ Israel
- ○ Italy
- ○ Jordan
- ○ Latvia
- ○ Lebanon
- ○ Lithuania
- ○ Luxembourg
- ○ Macedonia
- ○ Malta
- ○ Moldova
- ○ Monaco
- ○ Montenegro
- ○ Netherlands
- ○ Norway
- ○ Poland
- ○ Portugal
- ○ Romania
- ○ Russia
- ○ Serbia
- ○ Slovakia
- ○ Slovenia
- ○ Spain
- ○ Sweden
- ○ Switzerland
- ○ Syria
- ○ Turkey
- ○ Ukraine

- ○ United Kingdom
- ○ Other [ ]

2 []

How many employees does your NMHS have? *

Please choose **only one** of the following:

- ○ Less than 50 employees
- ○ Between 50 and 149 employees
- ○ Between 150 and 249 employees
- ○ Between 250 and 499 employees
- ○ Between 500 and 999 employees
- ○ More than 1.000 employees
- ○ Other [ ]

3 []

In which department/ division/ unit are you based in your NMHS? *

Please write your answer here:

[ ]

4 []

What is your position in your department/division/ unit (e.g. director, head of department, scientist, technical expert, etc.)? *

Please write your answer here:

[ ]

Section B: Products and services

5 []

Does your department/division/unit provide products/services for any of the sectors listed below?*

Please choose the appropriate response for each item:

	exclusive products for this sector	products may be applicable for this sector	no	don't know
Agriculture	○	○	○	○
Energy	○	○	○	○
Forestry	○	○	○	○
Finance and insurance	○	○	○	○
Health	○	○	○	○
Tourism	○	○	○	○
Transport	○	○	○	○
Water	○	○	○	○
Emergency services	○	○	○	○

6 []

For which scope of application are the products developed in your department/ division/ unit?

Please consider the differentiation of "instiutional users" (politics and administration) and "private clients" (economy) *

Please choose the appropriate response for each item:

	Institutional users				Private clients			
	Applies	Partly applies	Does not apply	Don't know	Applies	Partly applies	Does not apply	Don't know
User-specific tailored products (user requests)	○	○	○	○	○	○	○	○
Application-specific products (for specific applications but not user-specific)	○	○	○	○	○	○	○	○
General climate products (for scientific use, monitoring, basis for processing)	○	○	○	○	○	○	○	○
No direct application (for reference, validation, interest)	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○

7 []Which <u>other</u> scope of application do you have for the products/ services developed in your department/ division/ unit?

Please write your answer here:

8 []

What are the factors underpinning the decision to develop a particular product/ service in your department/ division/ unit?

Please consider the differentiation of "instiutional users" and "private clients" *

Please choose the appropriate response for each item:

	Institutional users					Private clients				
	It applies in all content	It is a frequent driver	It seldom applies	Does not apply	Don't know	It applies in all content	It is a frequent driver	It seldom applies	Does not apply	Don't know
User needs and requests	○	○	○	○	○	○	○	○	○	○
Norms and regulation (e.g. technical norms like ISO or sectro specific juridical regulations)	○	○	○	○	○	○	○	○	○	○
Meteorological and climatological scientific standards	○	○	○	○	○	○	○	○	○	○
Political interests (e.g. political agenda, agreements and contracts)	○	○	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○	○	○

9 []Which <u>other</u> factors are relevant for the decision which products/ services will be developed in your department/ division/ unit?

Please write your answer here:

10 []

For which time-scales beyond weather forecasts (~ 10 days) do you provide products/ services in your department/ division/ unit?

Please consider the differentiation of "monitoring products" and "forecast products"! *

Please choose the appropriate response for each item:

	Climatology			Forecast		
	yes	no	don't know	yes	no	don't know
monthly scale (up to one month)	○	○	○	○	○	○
seasonal scale (from one month up to six months)	○	○	○	○	○	○
annual scale (from six months up to one year)	○	○	○	○	○	○
decadal scale (from one year up to ten years)	○	○	○	○	○	○
multi-decadal scale (from ten years upwards)	○	○	○	○	○	○
other	○	○	○	○	○	○

11 []For which <u>other</u> time-scales do you provide products/ services in your department/ division/ unit?

Please write your answer here:

Section C: Use of RCC products

12 []

Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC?

Check here for details on WMO RA VI RCC products*

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know
- ○ Not applicable

13 []

Which of the product groups provided by the WMO RA VI RCC do you use within your department/ division/ unit? How often do you use them? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '12 [C01]' (Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC? Check here for details on WMO RA VI RCC products)

Please choose the appropriate response for each item:

	Permanent (all updates)	Regularly (specific frequency)	Occasional (if there is need)	Once	Never	Don't know	Not applicable
Monthly and annual bulletin	○	○	○	○	○	○	○
Significant weather events: maps, calendar and database (ESWD)	○	○	○	○	○	○	○
Parameter maps: Europe	○	○	○	○	○	○	○
Parameter maps: indivdual countries	○	○	○	○	○	○	○
Subregional products	○	○	○	○	○	○	○
ECAD Indices-of-extremes products: maps, graphs, trends	○	○	○	○	○	○	○
ECAD Indices-of-extremes: gridded data sets	○	○	○	○	○	○	○
Large scale circulation monitoring	○	○	○	○	○	○	○
Seasonal forecast products (impact maps, circulation products, outlook and global climate bulletin)	○	○	○	○	○	○	○
Seasonal forecast scoring and verification products (land boxes forecasts, oceanic plumes, model performance and reference material)	○	○	○	○	○	○	○
Digitized data on seasonal forecast and hindcast	○	○	○	○	○	○	○

14 []

For which scope of application does your department/ division/ unit use RCC-products?

Please consider the differentiation of "instiutional users" (politics and administration) and "private clients" (economy) *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '12 [C01]' (Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC? Check here for details on WMO RA VI RCC products)

Please choose the appropriate response for each item:

	Institutional users				Pricvate clients			
	Applies	Partly applies	Does not apply	Don't know	Applies	Partly applies	Does not apply	Don't know
User-specific tailored products (user requests)	○	○	○	○	○	○	○	○
Application-specific products (for specific applications but not user-specific)	○	○	○	○	○	○	○	○
General climate products (for scientific use, monitoring, basis for processing)	○	○	○	○	○	○	○	○
No direct application (for reference, validation, interest)	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○

15 []For which <u>other</u> scope of application does your department/ division/ unit use RCC-products?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '12 [C01]' (Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC? Check here for details on WMO RA VI RCC products)

Please write your answer here:

16 []What is the relevance of RCC-products for the quality of the products/ services produced in your department/ division/ unit? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '12 [C01]' (Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC? Check here for details on WMO RA VI RCC products)

Please choose the appropriate response for each item:

	High relevance	Medium relevance	Little relevance	No relevance	Don't know	Not applicable
Monthly and annual bulletin	○	○	○	○	○	○
Significant weather events: maps, calendar and database (ESWD)	○	○	○	○	○	○
Parameter maps: Europe	○	○	○	○	○	○
Parameter maps: indivdual countries	○	○	○	○	○	○
Subregional products	○	○	○	○	○	○
ECAD Indices-of-extremes products: maps, graphs, trends	○	○	○	○	○	○
ECAD Indices-of-extremes: gridded data sets	○	○	○	○	○	○
Large scale circulation monitoring	○	○	○	○	○	○
Seasonal forecast products (impact maps, circulation products, outlook and global climate bulletin)	○	○	○	○	○	○
Seasonal forecast scoring and verification products (land boxes forecasts, oceanic plumes, model performance and reference material)	○	○	○	○	○	○
Digitized data on seasonal forecast and hindcast	○	○	○	○	○	○

17 []

Do you know about specific examples for which your products (developed on the basis of RCC products) have been used by end-users? What are the affected decision-making processes?

Please specify your answer in the comment box! *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '12 [C01]' (Have your department/division/ unit ever used products or services provided by the WMO RA VI RCC? Check here for details on WMO RA VI RCC products)

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know
- ○ Not applicable

Make a comment on your choice here:

18 []What are the reasons for your department/ division/ unit for <u>not using / for a limited</u> use of RCC-products for the development of products/ services? *

Please choose the appropriate response for each item:

	Product specification do not meet our needs	Limited quality	There is no need for this product	We use other products instead	Don't know this product	Other
Monthly and annual bulletin	○	○	○	○	○	○
Significant weather events: maps, calendar and database (ESWD)	○	○	○	○	○	○
Parameter maps: Europe	○	○	○	○	○	○
Parameter maps: indivdual countries	○	○	○	○	○	○
Subregional products	○	○	○	○	○	○
ECAD Indices-of-extremes products: maps, graphs, trends	○	○	○	○	○	○
ECAD Indices-of-extremes: gridded data sets	○	○	○	○	○	○
Large scale circulation monitoring	○	○	○	○	○	○
Seasonal forecast products (impact maps, circulation products, outlook and global climate bulletin)	○	○	○	○	○	○
Seasonal forecast scoring and verification products (land boxes forecasts, oceanic plumes, model performance and reference material)	○	○	○	○	○	○
Digitized data on seasonal forecast and hindcast	○	○	○	○	○	○

19 []Are there <u>other reasons</u> for your department/ division/ unit for not using / for a limited use of RCC-products for the development of products/ services in ?

Please write your answer here:

20 []

Is there a potential (additional) application of RCC-products within your department/ division/ unit?

(e.g. if the specifications would be different; if other products would be available, etc.) *

Please choose the appropriate response for each item:

	Yes	No	Maybe	Don't know	Not applicable
Monthly and annual bulletin	○	○	○	○	○
Significant weather events: maps, calendar and database (ESWD)	○	○	○	○	○
Parameter maps: Europe	○	○	○	○	○
Parameter maps: indivdual countries	○	○	○	○	○
Subregional products	○	○	○	○	○
ECAD Indices-of-extremes products: maps, graphs, trends	○	○	○	○	○
ECAD Indices-of-extremes: gridded data sets	○	○	○	○	○
Large scale circulation monitoring	○	○	○	○	○
Seasonal forecast products (impact maps, circulation products, outlook and global climate bulletin)	○	○	○	○	○
Seasonal forecast scoring and verification products (land boxes forecasts, oceanic plumes, model performance and reference material)	○	○	○	○	○
Digitized data on seasonal forecast and hindcast	○	○	○	○	○

21 []

What are the requirements for existing RCC-products to be potentially used within your department/ division/ unit?

(e.g. specific parameters, resolution, tailoring, etc.)

Check here for details on WMO RA VI RCC products*

Kommentieren wenn eine Antwort gewählt wird

Please choose all that apply and provide a comment:

☐ Monthly and annual bulletin	
☐ Significant weather events: maps, calendar and database (ESWD)	
☐ Parameter maps: Europe	
☐ Parameter maps: indivdual countries	
☐ Subregional products	
☐ ECAD Indices-of-extremes products: maps, graphs, trends	
☐ ECAD Indices-of-extremes: gridded data sets	
☐ Large scale circulation monitoring	
☐ Seasonal forecast products (impact maps, circulation products, outlook and global climate bulletin)	
☐ Seasonal forecast scoring and verification products (land boxes forecasts, oceanic plumes, model performance and reference material)	
☐ Digitized data on seasonal forecast and hindcast	

22 []What additional products provided by the RCC would be helpful for your NMHS?

Please write your answer here:

Section D: Use of Climate Watch

23 []

Have you ever received a Climate Watch advisory provided by the WMO RA VI RCC? *

Please choose **only one** of the following:

- ○ Yes, several times
- ○ Yes, once
- ○ No
- ○ Don't know
- ○ Not applicable

24 []

For which scope of application do you use Climate Watch advisories in your department/ division/ unit? *

Only answer this question if the following conditions are met:
Answer was 'Yes, several times' *or* 'Yes, once' at question '23 [D01]' (Have you ever received a Climate Watch advisory provided by the WMO RA VI RCC?)

Please write your answer here:

25 []

What is the relevance of Climate Watch advisories for your department/ division/ unit? *

Only answer this question if the following conditions are met:
Answer was 'Yes, several times' *or* 'Yes, once' at question '23 [D01]' (Have you ever received a Climate Watch advisory provided by the WMO RA VI RCC?)

Please choose **only one** of the following:

- ○ High relevance
- ○ Medium relevance
- ○ Little relevance
- ○ No relevance
- ○ Don't know
- ○ Not applicable

26 []

Do you know about specific examples for which your products (developed on the basis of Climate Watch advisories) have been used by the end-user? What are the affected decision-making processes? *

Only answer this question if the following conditions are met:
Answer was 'Yes, several times' *or* 'Yes, once' at question '23 [D01]' (Have you ever received a Climate Watch advisory provided by the WMO RA VI RCC?)

Please write your answer here:

27 []

Do you use other early warning/ forecast products in your department/ division/ unit? Please specify your answer in the comment box. *

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know
- ○ Not applicable

Make a comment on your choice here:

28 []

What are limitations of Climate Watch advisories or reasons for not using them within your department/ division/ unit? *

Please choose **only one** of the following:

- ○ Product specification do not meet the needs
- ○ Limited quality
- ○ There is no need for this product
- ○ We use other products instead
- ○ Don't know this product
- ○ Other

29 []

Do you have potential (additional) use of Climate Watch advisories to develop products in your department/ division/ unit? Please explain the context/ purpose of use: *

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Maybe
- ○ Don't know
- ○ Not applicable

Make a comment on your choice here:

30 []

What are the required specifications of a Climate Watch advisory to be useful for your department/ division/ unit? *

Please write your answer here:

Thank you for your participation!

For more information on the EUPORIAS project or to see outputs from this project: www.euporias.eu

Submit your survey.
Thank you for completing this survey.