Climate services for disaster risk reduction workshop: report




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Co-organised by Copernicus Climate Change Service (C3S), PLACARD &
European Research Area for Climate Services (ERA4CS)

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Workshop report

- Jaroslav Mysiak (CMCC, PLACARD) welcomed the participants on behalf of CMCC.
- Rob Swart (WENR, PLACARD) introduced the objective of the workshop: how should climate services be developed in Europe to effectively support Disaster Risk Reduction (DRR). He then interviewed representatives of the three organising programmes, who described these programmes and their interest in the issues to be discussed at then workshop: Roger Street (University of Oxford) for ERA4CS, Mário Pulquerio (FC.ID) for PLACARD, and Carlo Buontempo (ECMWF) for C3S.

- Two break-out groups **A** addressed the following question: **What are the strengths and weaknesses of the data supply infrastructure you are using?**, focusing on the European and national-local level, respectively. Specific questions were:
  - Which sources of climate information do you currently use (public/private services, research) and for what purposes?
  - Why have you chosen to use these sources (quality, accessibility, formal requirement)?
  - Which strengths and limitations do these sources have?
  - What additional types of information (climate or other) you'd need for your activities and is currently missing from the public offering?
- Detailed notes of A are included in Annex 1. Some key findings from the discussions:
  - The *variety of sources being used is large* and dependent on sector, region and purpose of the specific climate service, so further work on the 1st question requires a larger pool of users than represented in the workshop.
  - Climate services can *support all elements of the disaster management cycle in different ways* requiring different information and data sources – climate information can strengthen prevention and recovery, but also strategic planning for preparedness and response.
  - It was recommended to develop *an event catalogue (or library)*, including meteorological and impact data, which could be developed and maintained at C3S, to use findings from an extreme event in particular locations to another location because of the scarcity of information for that location, cautiously and taking into account local characteristics. Citizens can be involved in developing and cataloguing local impact profiles.
  - A strong recommendation was to consider *vulnerability and exposure information* (impacts, elements at risk, loss) in the climate services to be provided for DRR.

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- Criteria for selection of specific sources mentioned included *accessibility, accuracy, confidence and trust, guidance on selection of scenarios or models, availability of adequate fit-for-purpose metadata, transformation tools and indicators derived from raw data*. Standardisation would help selection and use of data sources.
- One important issue raised was that at least as important as the quality and accessibility of climate data is the *quality of the system of interactions for effectively and efficiently sharing the information* in support of DRR, i.e. the connections between different relevant governmental levels, between scientists and practitioners, and between actors at one level.

- Sergio Castellari (EEA) facilitated a plenary session in which Diogo de Gusmão-Sørensen (DG R&I) gave a European outlook for adaptation science, research and innovation, Silvano Pecora (ARPAE) presented Italian experiences with climate services for disaster risk reduction in the water sector and Tom Philp (XLCatlin) explained how the insurance industry uses climate information for DRR.

- Two break-out groups **B** addressed the following question: **How can climate services facilitate and improve the integration of disaster risk reduction into different sectors and regions?**, focusing on the preparedness and response (short time horizon) and prevention and recovery (long time horizon), respectively. Specific questions were:
  - Which aspects of DRR decision-making are more like those for Climate Change Adaptation (CCA)? Where are they dissimilar?
  - Is there different between sectors? (e.g. water, agriculture and forestry, energy and transport, health, insurance, coastal management, tourism, infrastructure)
  - How can we best factor into DRR practices the sectoral knowledge on the changes in the sectoral risk profile?
  - How can the connections between climate service provision for DRR and CCA be improved to support mutual learning and innovation?

- Detailed notes of B are included in Annex 1. Some key findings from the discussions:
  - The *terminology of "climate services"* and potential related misunderstandings about what they cover can be an important impediment for uptake for DRR. In particular, for DRR the distinction between short and long term can be confusing and *connecting climate and weather information* can enhance uptake of CS by DRR actors (changes in frequency and intensity of weather events). Sub-seasonal to longer time scale predictions (monthly, seasonal, decadal) can help integrating CCA and DRR[1], taking skill limitations into account. Also, connecting hazard (climate and weather) information with vulnerability information is important for recognising the relevance of climate services for DRR.
  - Important but very different clients of climate services for DRR include *municipalities (e.g. local civil protection/emergency services), insurance companies (public and private) and the financial sector* (e.g., stress testing of investments). For ethical reasons, there should be *no financial barriers* to access disaster-relevant information. For most sectoral clients, a *multi-hazard approach* was recommended.
  - Obstacles to the development of climate services for DRR include *lack of political cohesion, uncertainty about CS provider authority, continuity, planning, legal requirements (regulation, standards), sense of ownership and trust*. Reporting requirements such as those in the context of the Sendai Framework support the integration of CCA and DRR.

1 Sub-seasonal to seasonal prediction (S2S) can provide crucial input to DRR planning, even without climate change context

- A *centralised coordinated European climate agency* could coordinate the data and standards on how to use the available data and maintain the tools and knowledge that is produced from the many different climate services projects (legacy). Alternatively (or complementary in case the European level would be limited to a repository of climate data rather than a climate service agency), a different model could be developed that focuses on innovation and market uptake (e.g., related to the EU Innovation Council).
- Climate services are not only useful for DRR from a CCA perspective. DRR can also strengthen CCA when it can be demonstrated that *CCA investments can address some key risks in the short-term* in addition to having long-term benefits.
- DRR it is *not a sector but a cross-disciplinary approach in civil protection* and should also be integrated in other sectors (e.g., water management, health, insurance, agriculture and forestry), taking into account the specific characteristics of each sector. This has to be reflected in the C3S Sectoral Information Systems (SIS).
- *Training and capacity development* on climate data and methods is important for advancing climate service development for DRR, including data providers, but also knowledge brokers and technical staff of public and private sector users.

- Two break-out groups **C** addressed **specific DRR climate information needs**, focusing on the international-national and regional-local level respectively. Specific questions were:
  - What aspects of the decision-making processes within DRR would benefit from climate services and why?
  - What other specific data/information may extend the existing services?
  - The provision of which information should be best left to the national/international or regional/local level, respectively for the 2 groups?
  - The provision of which information could we benefit the most from a standardised pan-European approach?

- Detailed notes of C are included in Annex 1. Some key findings from the discussions:
  - The question which *climate service information is needed to support decision-making* (how would it change a decision? how can the added value be demonstrated? Which communication means best support decisions?) is very important but difficult to answer. More work is needed to evaluate and demonstrate the impacts of climate services on decision-making. This is relevant for climate services in general but maybe even more for DRR.
  - Climate services would be useful for all phases of the Prevention-Preparedness-Response-Recovery cycle *if properly integrated into planning and design*. Emphasis would be on incorporating climate and related vulnerability information in strategic planning.
  - Also in the context of this session the importance of *vulnerability and impact information* was stressed – hazard information can be but a small component of the information needed for a good risk assessment.
  - Climate services are needed at *different administrative levels for different types of decisions*. An authoritative European source would be *specifically important for countries with a relatively weak national climate information system*. European information is to be complemented by local and regional information, which may not only sometimes be formally required, but can also be more relevant (e.g., local vulnerability information). Effective communication and knowledge sharing between administrative levels is important.

- *Disasters do not respect borders* – a European service is particularly relevant for transboundary risks. Existing collaboration between C3S and Copernicus Emergency Management Service (droughts, floods, fires) should be further strengthened in this context. A European service should also play a key role in standardising or harmonising information, which would facilitate cross-border risk assessments.
- *Roles of different providers* (national hydromet institutions, knowledge brokers) are usually complementary and differ between countries. For private climate service providers/knowledge brokers their business case is the most important driver, for public services the policy requirements (e.g., from national adaptation strategies and civil protection plans).

- Two break-out groups **D** addressed **Future steps to be taken: filling knowledge gaps and developing a viable climate service market**, focusing on research needs and conditions for market development, respectively. Specific questions were:
  - What are the key data and information gaps in terms of data and services for DRR (from research, monitoring, modelling)?
  - How could these gaps best be filled?
  - How can the emerging market of climate services be strengthened in terms of reaching out to the DRR community? Please describe/ discuss any specific actions that you consider important for this purpose.
  - What should the relationships between C3S and other programs (national and international, public and private sector) be and how could they be best harmonised?
  - What type of information and/or knowledge can CS add value (e.g. increased competitiveness) to stakeholder activities? Detailed notes of C are included in Annex 1. Some key findings from the discussions.

- Detailed notes of D are included in Annex 1. Some key findings from the discussions:
  - It has yet to be demonstrated that improving climate projections leads to better decision-making and therefore *guidance on how to select and apply the most suitable information* maybe more important than more and better data, taking into account that *information good for one type of decision is not necessarily the best for another*. Research on the relationship between climate information and decision-making is urgently needed, which would involve *social science research to better understand the social, political and governance dimensions of CA for DRR* and also to support the development and application of effective communication methods.
  - Additional research on improved modelling, monitoring and re-analysis is still useful, but may be *guided more by a good analysis of what users really need* (in terms of indicators, resolution, frequency) and maybe designed as a co-production process.
  - Issues about which knowledge was considered specifically weak included turbulence, tropical cyclones, the relationship between climate and air quality, limited public awareness of risks, effectiveness of different communication methods.
  - Recommendations such as the above can still be provided to the Commission in the context of the consultations for the revision of the European Adaptation Strategy and the development of the 9th Framework Programme.
  - Climate service market development for DRR was considered to be slow partly because of the current phase of raising awareness of the relevance of climate for DRR, which for various reasons is seen as a public responsibility. In a next phase, *a move towards specific assessments of risks and opportunities at local or company level, would foster "premium services"* for tailoring information at a cost.

- Four ways of improving the *provision of climate services* are suggested: (a) develop and advertise *good practice examples* (showcases, successful business cases), (b) develop a *quality assessment and control system* for climate services, (c) develop *capacity to provide tailored services*, including data, indicators and tools, and (d) taking a *broad perspective on climate services*, e.g. including non-climate information (vulnerability, exposure) and supply chain vulnerability.
- Four ways of improving the *demand for climate services* are mentioned: (a) make assessment of climate risks and response measures *obligatory* (legally required), (b) *standardise* methods for operations and design (e.g., ISO), (c) require *disclosure of climate risk informatio*n for investments, e.g. for companies to get loans or insurance by the financial sector, and (d) promote climate-resilience and climate-friendliness as a *reputational issue*.
- C3S should actively connect not only to public and private institutions that deal with CCA but also with DRR. C3S could also actively create opportunities for climate service providers to meet, share experiences and learn to help foster market growth.

Annex 1: Summary break-out groups

A What are the strengths and weaknesses of the data supply infrastructure you are using?

1 European level

Q1 Which sources of climate information do you currently use (public/private services, research) and for what purposes?

Q2 Why have you chosen to use these sources (quality, accessibility, formal requirement)?

- The company Météo France International, which provides mainly services and products for Met Offices based on observations and satellite data, uses data sources such as NOAA, CDC, JCM, weather station data, data from countries that is not open access, data provided by Météo France, seasonal forecasts: Copernicus (multi-model approach rather than using a single model), rainfall data.
- The EEA used the Munich Re data for disaster loss data, arguably the most critical issue for DRR. It provides coverage of 33 countries, including many of the EIONET countries. A big gap from a European level perspective is that a coherent public set on DRR to cover the whole of Europe is not available that Copernicus could fill. The reporting requirements in the context of the Paris Agreement, the Sendai Framework and the SDGs trigger a demand for such data, and not all countries are at the same level. JRC is an important data provider for the EEA (e.g., CLIM 39, 36 are available on the EEA website but not the methodology which would describe the provenance).
- The EU-Circle project includes five case studies for which it was very difficult to find suitable data. Information about hurricane Matthew (high-resolution hourly from a global model) was transposed to a different region in an attempt to simulate what would have happened, if storm X was going to hit, a practical way but not a very "scientific" one.
- Floods are the hazard type the most successful for successful integration of CCA and DRR (e.g., in Germany, Netherlands, etc.).

Q3 Which strengths and limitations do these sources have?

- Extremes are rare and therefore many data are needed. For risk assessments, big ensembles should be used.

- It is noted that the role of weather services is often not clear and varies between countries. In some cases they provide services, while in some other cases they provide just data.
- It is difficult to compare impact assessments across different countries.
- An 'event catalogue' would be useful and it would have more value if it included also impact data. Generally, it is suggested that historical observations are at least as relevant as projections.

Q4 What additional types of information (climate or other) you would need for your activities and is currently missing from the public offering (general level, specific in Breakout group C)?

- For useful risk assessments and impact modelling, data sources should cover the elements at risk, their vulnerability, and the hazard data required to evaluate impacts. An easily accessible library of these (available) data is needed for different hazard types, which could be C3S.
- Maybe as important as the availability of data and information is sharing it in an effective and efficient manner – many communities involved in DRR do not effectively communicate. E.g., civil protection agencies have information on extreme events, required to plan for and respond to such events, but they do not always communicate it adequately to other actors. Different actors with different skills and roles such as statisticians, CCA experts, DRR experts and climate and climate impacts scientists should work together. Existing raw data have to be translated into indicators that can be easily communicated, taking into account the purpose for which the data will be used, covering both climate and socio-economic data.
- People work with what they have and know. More or different data may be needed and available and need to be made easily accessible in a well-organised manner, taking into account issues such as accuracy (related to uncertainties) and confidence (related to quality control) as important elements. Good metadata are crucial and these should address the needs of the users.
- Data gaps exist for, e.g., straight-line winds, winds gust, hailstorms and flash floods, and the impacts of such events, which may be partly derived from information available of insurance companies. But even for effective coverage of precipitation and temperature efforts have to be stepped up.

2 National, sub-national and local level

Q1: What source of information are you using?

- The discussion did not single out any particular type of climate knowledge nor was any additional source of information or knowledge identified that may be needed. This is perhaps because the same information has or may have different value for different users. Better understanding of what choices can be improved by using climate information and where to get that information.
- There are modes of interaction that facilitate the understanding of the information needs. Some of them are partnerships such as the NHP in the UK. Climate information needs to be coupled with information on the ground, e.g. for floods. A good practice example is the UK Natural Hazard Partnership (NHP), which combines 15 organisations reporting on all climate hazards. Every day information is shared, helping both policy and practice. Planners can take the information into account, e.g. so that emergency facilities like hospitals can be prepared. Also prevention is linked, with each government department involved being responsible for sectoral planning. Reasons why this partnership works include the positioning (cabinet office) accountability, transparency, trust and fit-for-purpose information. The NHP facilitates the understanding of the information needs and subsequent evolution of information supply. At lower administrative level local resilience fora and bottom-up networks of practitioners exist, e.g. "snow angels" bringing first aid for people trapped by heavy snowfall.

Q2 Why have you chosen to use these sources (quality, accessibility, formal requirement)?

- Climate information is mainly used for strategic purposes. The required information is different for the short and long term: e.g., for risk assessment for the next few days weather information is required, for agricultural insurance seasonal forecasts may be of interest, while for property insurers longer term projections/scenarios are relevant. Time series of climate and climate impacts observations (monitoring of the past) are relevant to evaluate climate, and define critical thresholds with which future weather can be compared. Other types of information are needed too, notably to assess the vulnerability of the territory. To optimise early warning systems the system needs to be recalibrated to include changes in extremes from predictions or different type of weather-related events, such as more floods from smaller catchments. For flood protection, it is important to include climate in statistical analysis to design better protection measures and infrastructures.
- DRR is a large area of action. Climate services are more common for preparedness (early warning) and recovery (risk financing) but prevention and protection can and should be better informed.

Q3 Which strengths and limitations do these sources have?

- When considering strengths and limitations, it is noted that a lot of data can be available (e.g., on climate or on discharge and impacts of hydrology for flood protection), but the description of those data (metadata) can be weak. Also, the selection of the best data sources and models, the correct transformation and use, and appropriate description of the data are other potential weaknesses of the data management system. Standardisation can help. Standardisation and the establishment of a learning network would be useful.
- A main limitation in evaluating strengths and weaknesses of information sources is that is not known what information is really needed that would change decisions. Research on this question would be extremely useful in a current situation in which much research is funded that leads to outcomes the impact of which on decision making is fundamentally unknown.

Q4 What additional types of information (climate or other) you would need for your activities and is currently missing from the public offering (general level, specific in Breakout group C)?

- It is argued that the climate services debate focuses too much on climate alone, while losses (of assets, life, money) are more relevant for decision-making. Climate information is but a small part of a long chain, which covers vulnerability, and magnitude and probability of extreme events (past and future, reanalysis). In the insurance sector a key issue may not be which additional information would be needed, but how the currently privately owned and applied information (e.g., cat models) can be developed, accessed and used: notably transparent cat models are missing. A (European) centre for CAT/disaster modelling would fill a gap in public knowledge about disaster risk. Also, the insurance sector has a lot of vulnerability information that would be useful for public purposes.
- It is suggested that rather than that specific kinds of information are lacking, a key problem is that connections between different communities and associated data sources are often poorly developed and hence institutional collaboration and coherent information delivery should be strengthened both horizontally (between sectors) and vertically (from national to local). For example, the climate research community is not well connected to the vulnerability community, the distance between modellers and end-user clients is huge, and between national strategy and local implementation. Relationships between different knowledge systems should be built, including the translation of the information. Climate services do not make these connections, climate services broker information between actors taking into account that there are different types of users who have different skills and require different information.

- Retrospective climate services are important – services that help to fill the data gaps and improve understanding of the dynamics underpinning loss events. Local climate impact profiles can help getting a better understanding of past events at low cost, e.g. by involving citizens (citizen science). The TEMPEST project in Nottingham used historical records from individual people's diaries. Like always, also in this context definitions are a challenge since different people interpret terms differently (e.g., what is a heat wave).

B How can CS facilitate and improve the integration of DRR into different sectors and regions?

1 CS for DRR in support for the different sectors in terms of preparedness and response. How this articulates by sectors and region? (Short time scale)

Q1 Which aspects of DRR decision-making are more like those for CCA? Where are they dissimilar?

Q2 Is there difference between sectors? (e.g. water, agriculture and forestry, energy and transport, health, insurance, coastal management, tourism, infrastructure)

Q3 How can we best factor into DRR practices the sectoral knowledge on the changes in the sectoral risk profile?

Q4 How can the connections between climate service provision for DRR and CCA be improved to support mutual learning and innovation?

- The discussion in this Break-Out Group started with the issue of terminology and the potential misunderstandings related to it (i.e. what do we mean by "short" time scale: the time horizon or time scale?). DRR refers usually to short time and spatial scales. On the other hand, CCA is usually wider, looking also at 'non-extreme' cases in a larger area. Politically speaking, climate services (should) consider more than 90 days (while weather services <90 days)[2]. But this definition does not capture of what really happens at the local level in a DRR context.
- A demand for weather services exists to deal with the existing adaptation deficit (economies and localities not adapted to the current climate risks let alone the future) in the short term. Dealing with weather and climate-related risks on the longer term requires both short and long-term information, i.e. weather forecast plus climate projections and predictions. Many actors in Europe are not yet interested in climate change but they are in disaster risk – decision-makers often prioritise resilience today because resources are insufficient to target the long-term.
- An example: in the CLARITY project the municipality of Naples is interested in having information like an index of sustainability of the cost of adaptation measures, to support their decision-making related to local norms for buildings in order to renew part of the town and if needed motivate extra expenditures. The information needed would require downscaling, statistics and probabilities, multi-criteria analysis, and cost-benefit analysis of adaptation measures.

2 In general, sub-seasonal to seasonal and longer time-scale predictions are considered to be part of climate services, and medium/short range predictions as well as nowcasting are considered to be part of weather services. It is also important to distinguish between the averaging period of the predicted variable and the lead time for the prediction.

- Responsibilities for bringing together and using different information sources should be clear but this is often not yet the case. An effective system includes knowledge brokers, which can use various data sources of which Copernicus should be a key institution at the European level. Both public and private providers should play a role with potentially different mandates in different countries – the effectiveness of the system and the associated climate service market differs between countries but can often be further strengthened.
- A key question from an ethical point of view is to what extent climate services should be free. Disaster risk reduction could be considered as a fundamental responsibility of the public sector and access to information may not be limited by their cost. For clients who could theoretically cover the costs to access the service, its benefits have to be clear (e.g., if we make investment A, we will see benefits B in areas x and y).
- Insurance is a user of climate information but also a provider of (loss) data. There are big differences among (public and private) insurance companies. The public sector may communicate information more easily and freely because of lack of competitiveness or profit issues. In Spain the public insurance sector uses loss data to refine flood maps as a result of the WFD. This data is used to refine or to calibrate models and flood maps.
- Local municipalities are potential users of climate services: if a local government wants to win the next elections, it needs to respond effectively to disasters. National and European information sources should be better connected to local public sources that often have much better data on relevant issues such as exposure and vulnerability. These sources should be involved in the delivery of standardised data to the national level and subsequently to the international level (e.g. Sendai reporting requirements).
- Another potentially large user group is the financial sector: next to transitional risks (energy transition) also physical risks are important for investments (e.g., stress testing).
- Obstacles to development of climate services for DRR include lack of political cohesion, continuity, planning, legal requirements, sense of ownership and trust.
- A centralised coordinated European agency could coordinate the data and standards on how to use the available data. Such an agency could also maintain the tools and knowledge that is produced from the climate services different projects. Alternatively (or complementary in case the European level would be limited to a repository of climate data but not a climate service agency), a different model could be developed that focuses on innovation and market uptake. E.g., The EU Innovation Council (to be launched by 2020 could support the creation of climate-service SMEs and to scale up the solutions.
- Climate services are not only useful for DRR from a CCA perspective, DRR can also strengthen CCA when it can be demonstrated that CCA investments (which usually have long-term benefits) can address some key risks in the short term.
- A multi-disciplinary/multi-hazard approach is recommended, bringing different scientists together to build climate services together, developing and using a clear common language to communicate.

2 CS for DRR in support for the different sectors in terms of prevention and recovery. How this articulates by sectors and region?

Q1 Which aspects of DRR decision-making are more like those for CCA? Where are they dissimilar?

Q2 Is there different between sectors? (e.g. water, agriculture and forestry, energy and transport, health, insurance, coastal management, tourism, infrastructure)

Q3 How can we best factor into DRR practices the sectoral knowledge on the changes in the sectoral risk profile?

Q4 How can the connections between climate service provision for DRR and CCA be improved to support mutual learning and innovation?

- As to the policy context, it is noted that Sendai and SDGs are not binding and thus activities in this context are not delayed by political constraints (and thus go faster) but can have lower urgency than the much more political and binding Paris Agreement. Technical guidance for implementing the Sendai Framework doesn't mention Climate Services other than in a rather indirect form.
- C3S has included DRR as a sector in its Sectoral Information Systems (SIS) while in fact it is not really a sector but a cross-disciplinary approach into civil protection but also other sectors (water management, health, insurance, agriculture and forestry). It has to be taken into account that different types of extremes are relevant for different sectors, requiring a different focus of climate services (e.g., on return period and magnitude of potential extremes). In some sectors, extremes are already included in planning requirements, e.g., the Flood Directive asks for including climate change information in risk assessments.
- Moving beyond a vision of DRR as a sector could be a value added of C3S. A key question would be: how would your work be different if you look at it from DRR and/or CS point of view?
- The development of standards for climate data (and climate risks assessment) is suggested as a way to integrate climate risks into sectoral decision-making.
- It is suggested that transboundary climate risks may be underestimated and need to be addressed as well. Next to C3S the Disaster Risk Management Knowledge Centre is an important source of Europe-wide information in this context that should be well-connected to C3S. The Copernicus Windstorm Information Service (WISC) is mentioned as an example of a coherent and organised system of information about DRR events for other perils.
- Raw data in itself is difficult to use for many potential users, so there is a need for training and capacity development on climate data and methods such as downscaling, using showcases as good practice examples. Capacity development should address data providers, knowledge brokers and technical staff of public and private sector user institutions.
- Moving from weather to climate means going from emergency response to strategic planning of response and prevention. Intermediate timescales (monthly, seasonal and decadal predictions) can help integrating CCA and DRR.
- There are multiple sources of information and multiple way of using this information. Users need guidance on how to select and use suitable data. IPCC makes sense of the available information ponce every 5-7 years, but not more often and not at national, regional or local level. A discussion on developing good practice guidance on climate change projections would be useful (e.g., like in SE Asia)
- Given that the Sendai framework asks to report on the number of countries that have multi-hazards early warning systems, providing inputs into those systems could be an easy way for climate services to contribute to DRR.
- The skills of climate predictions are very small after one month, which makes direct input from climate services into early warnings ineffective because of large uncertainties involved. Vulnerability and exposure information on longer-term risks however would allow for prioritisation and strategic planning of early warning and emergency response. It is suggested that the climate service provision is too much one way, supply-driven. Potential clients need to educate the CS community on why they don't use the services. Vulnerability is usually more important than the (climate) hazard so should be connected.

C Specific DRR climate information needs

1 (Inter-) national level

Q1 What aspects of the decision-making processes within DRR would benefit from climate services and why?

- Transboundary coordination would be useful (e.g. forest fire response and preparedness). For most hazards, this is not in place at the moment. At the EU level these transboundary issues should be identified. While JRC is increasing the attention to this transboundary issue, a new EU Emergency response and coordination centre to deal with the transboundary level may be useful, taking into account existing civil protection legislation. The Danube River is one good example of transboundary collaboration.
- All phases of the Prevention-Preparedness-Response-Recovery cycle would benefit from better Climate Services if they were properly integrated into planning and design. The planning process (e.g. building power plants or other critical infrastructure) should take into account climate data and information. This should be further enhanced.
- CS at the prevention and recovery phases can inform the strategic planning to address the challenges, including the impacts of climate change (and thus vulnerability and exposure). Preparedness and response are more related with weather services, but CS can still help to effectively position resources for preparedness and response. However, users many times do not make a clear distinction between weather and climate as scientists do and the development of CS should consider this, in particular for DRR.

Q2 What other specific data/information may extend the existing services?

- Standardising of information that can be used for planning the preparedness and response stage is a useful extension of existing services.
- Some participants suggested that the highest resolution would be needed for reliable information with increasing quality, simultaneously providing information about uncertainty. C3S should provide this information. Others stressed that while high resolutions may be useful for some applications, for planning of many response measures this is not needed (fit-for-purpose information).
- It is important to understand the present probability of the occurrence of extreme events. Swiss Re is trying to understand how risky cities are to some type of events.
- An important question to be addressed is if CS should also include information on vulnerability and impact. Doing impact assessments may not be enough for helping to create a response from the relevant actors. Vulnerability, as part of the information, may be useful for all phases of DRR cycle, taking into account different information needs of different actors who do not always collaborate well.

Q3 The provision of which information should be best left to the national/international or regional/local level, respectively for the 2 groups?

- EU information might be more useful for less developed countries where the national system is still not well developed. It can fill the gap where there is no information yet at the national level.
- Climate services at the EU level should address multiple hazards and set a baseline of information that can further be developed at higher resolutions at national and local level.

- It is important to evaluate the impact of the value of CS for better decision-making and show the added value of international provision of data and information. It has still not been demonstrated that improvement on knowledge from climate projects has contributed to making better decisions, so evidence for this is needed, e.g., at the EU level. Resources should be allocated to study what kind of climate information the different kinds of decisions need.
- Local data and information are most relevant for the preparedness and response aspect, while EU data and information would be much more about strategic decisions and prioritisation at the national level. The EU should provide a way to compare data at lower resolutions for different countries and demonstrate the reliability of this data. EU data provision also has a role to address transboundary issues.
- The development of a EU database on risk and perils and their correlations might be quite useful. The EU could also provide a review of outputs of post-event analysis.
- There might be a conflict (or tension) between data provided at the EU and national levels for political reasons. National actors could be required to use national funded databases instead of European databases, which often makes sense.
- For DRR, seamless information from short to medium to long time decision-making is useful.

Q4 The provision of which information could we benefit the most from a standardised pan-European approach?

- CS should enhance resilience by sharing climate and loss data with the highest resolution possible, quality-controlled and homogenised to be useful to decision-makers.
- There is a strong need for accountability and liability for climate providers. The information needs to be trusted to support decision-making.
- JRC can play an important role in this context.
- C3S is already collaborating with Copernicus Emergency Management Service, but this collaboration should be improved.
- There is a need for partnership between DRR and CS communities as information and knowledge that is created and provided are overlapping and/or complementary.

2 Subnational (regional and local) level

Q1 What aspects of the decision-making processes within DRR would benefit from climate services and why?

Q2 What other specific data/information may extend the existing services?

Q3 The provision of which information should be best left to the national/international or regional/local level, respectively for the 2 groups?

Q4 The provision of which information could we benefit the most from a standardised pan-European approach?

- There is a clear divide between climate services for the local, national and European or international level. National authorities need to deliver national information, e.g. for the Sendai framework, but often require access to a pan-European infrastructure for information beyond their borders – Copernicus could deliver part of this infrastructure.

- Since at the regional level there are other players, it is important to have one voice at the national level but at the same time there should be actors for regional level coordination and have a consensus about how the regional inputs can be coordinated and integrated. This requires a standardised approach as the system's backbone, which, however, should allow for enough room for development and flexibility. It is noted that Germany will not report to Sendai for the first round as a nation: while there is a platform as a national contact point, most activities and associated reporting are at the regional level.
- The national weather (or hydro-meteorological) services play an important role in providing services on weather- and climate-related hazards and should provide guidance on the risks and how to manage them, including how to interpret the data and information provided (e.g., for a heatwave or a drought uncertainty information needs to be communicated). The role and responsibilities of private climate services companies are less well-defined.
- At the European level, the EU civil protection mechanism is coordinated by DG ECHO and requires countries to have a legally binding stakeholder platform for DRR (a forum for discussion from which the needs for data emerge). This may promote the development of standards for carrying out risk assessment, which could be an entry point for climate services in civil protection and also integrate climate services in DRR for other sectors. Standardisation and harmonisation of data was again emphasised: through web services data and information can be presented in a standard way.
- Knowledge brokers are an important component of the communication network. Providers supply their data with their own methods, the broker can elaborate on them, provide information to users in the standardised way, based on an open architecture and then tailor the data to user needs.
- In terms of hazard types, flood risk reduction is the hazard best understood, but still integration of CS and DRR can be improved in most countries. Disasters that are less well covered are water scarcity and forest fire, both important issues particularly for the south of Europe. Forest fire may not be a direct climate hazard, but climate is an important trigger among many others.
- The importance and urgency of climate services may become clearer if they are communicated and framed from the perspective of national, regional or local adaptation strategies and plans, or even in the context of wider sustainable development objectives. Vertical coordination between administrative levels is important, dependent on the type, location and magnitude of the hazard. For early warnings the national services are important but for what has happened in terms of damages and losses the European level can provide important additional insights.
- The UK Natural Hazards Partnership brings together academic and meteorological services to produce a warning every day, bringing together local networks, hospitals, local level actors, emergency planners, the private sector, including, e.g., electricity providers. NHP puts efforts on a centralised communication approach.
- While quality control of data and information is important (traceable, transparent, accurate, science-based, accompanied by uncertainty information), also the evaluation of the (effectiveness of) communication content and methods is important. The importance of communication about hazards and risks management to citizens and stakeholders is very high and requires adequate resources. Users' engagement is important to understand what users need but also for users to understand what data is available and how it can be used. Capacity building and training are important, starting at national and subnational level, following international guidelines to the extent available.

- Also this break-out group suggested that a pan-European authoritative (entrusted) data provider offering a common database (data store) would be useful, but added that the way that data is communicated should be different in the different countries in order to accommodate to the cultural differences and different contexts. "No journalist in Europe would hesitate to cite a warning from NOAA. But in Europe we are still lacking such an entrusted source." ECMWF/ Copernicus is making efforts towards this direction.
- While for the private sector a business case should be made, in the public domain there are societal drivers, with National (or regional/state) Adaptation Strategies and national risk assessment under the EU Civil protection mechanism being among the most important ones.
- In conclusion, the appropriateness of the scale of the CS depends on the objectives: for certain issues the European level is more appropriate but for others it is the national level. Hazards should be dealt at pan-European level, including wind storms, vector-borne diseases, sea level rise for coastal protection.
- There is a need for a backbone at the European level that is standardised and accessible, but the tailoring of the information (e.g., early warnings) should be done at the national level.
- Potential gaps include climate- and weather-related air pollution and the limited awareness of citizens of the risks.
- Communication across actors operating at different governance levels can often be improved. For example, in the case of fires in Portugal much delay was caused due to a bad communication between regional and local authorities and a not very clear understanding of their roles, responsibilities and competences. Help that came from Spain was completely miscommunicated.

D Future steps to be taken: filling knowledge gaps and developing a viable CS market

1 Priorities for research and innovation supporting CS for DRR

Q1 What are the key data and information gaps in terms of data and services for DRR (from research, monitoring, modelling)?

Q2 How could these gaps best be filled?

- Maybe more important than the lack of data is the difficulty in selecting the most suitable information from what is available, e.g. people often ask what is the best model. The challenge is to make use of all the available information and the large volume of data and apply it in a useful way. This may require Artificial Intelligence, statisticians and other means.
- The "best" information depends on the decisions we want to make – what is good for one type of decision might not be for another. The full decision chain and type of questions that require an answer need to be understood to effectively link them to the CS and products and communicate the limitation of available information. 'Decision chains' may change for different sectors or governance levels over time.

- It was stressed that it was not yet demonstrated that the improvement of climate projections would lead to better decisions in all cases, and indeed it cannot be proven. Yet some evidence is needed in order to justify the research investments that are made in improving modelling. It seems that complementary research is useful for understanding what "user needs are (resolution, quantity of information, frequency, etc.) and how to effectively co-produce information. In a UK project, CS needs were explored through learning labs, following a co-production process which did not lead to any new research questions for climate scientists – understanding the risk was sufficiently good to act. Evidently, also fundamental research remains needed, e.g. on issues such as turbulence or tropical cyclones, as well as monitoring and re-analysis.
- Decision-makers do not think in the long-term because the system is not designed to reward for a long-term thinking. Therefore the integration of CS into DRR is a challenge. At the same time dealing with DRR, like CCA, is also a complex social, political, governance issue, while (too?) much of the CS work currently focuses on the technical aspects. Media can help challenging the emphasis on short-term decision-making and on technical issues in climate services, and help raise awareness.
- Using real-world experiences with weather extremes (cold/warm) can play a role in communication. Characterisation of weather extremes for a future climatology could be an interesting approach ("how records are broken"). Also, concepts can be used that mean something to people, e.g., how much of tax income is used for dealing with anomalous and extreme events? (e.g. roads melting, hospital under stress due to extreme heat). People need to understand such issues in practical terms.
- Social science research on climate services (e.g., psychology, ethics) is a gap. The decision-making process (related to individual and social responsibility) should be better understood by climate service providers, e.g. why people keep buying houses on flood risk areas and what the ability of different actors is to implement solutions. Often, CBA assessments have been performed not to support but to stop action. The decision-making process has to be understood across all different aspects of DRR in order to identify where we see the real benefits for integration of CS. Co-producing narratives or storylines is a promising and simple tool to incorporate uncertainties in a simple/ understandable way and to communicate risks and response opportunities.
- Opportunities for filling the gaps exist in the process of programming FP9 and as a result of the evaluation of the European Adaptation Strategy.

2 Priorities for CS/DRR service and market development

Q1 How can the emerging market of climate services be strengthened in terms of reaching out to the DRR community? Please describe/ discuss any specific actions that you consider important for this purpose.

- It is suggested that the evolution of climate services has two phases for DRR as for other areas/ sectors. In the 1st phase awareness of climate risks and opportunities has to grow. In this phase, free public services are required. In a 2nd phase, companies and public bodies would move towards concrete risk assessments and development of response options. In this phase, tailored services are needed, which come at a price (premium services, private sector consultants). The market can grow from small specific niches to extend to broader areas.

- Market development should be enhanced along two lines: improvement of the supply of, as well as the demand for climate services. At the moment, emphasis is very much on the former, which is important but insufficient for market growth. A perception that DRR is a public responsibility may limit the opportunities for the development of a commercial market. Indeed, in many (Western and Northern European) countries the level of public information availability c.q. climate service provision is quite high, but this can be different in other (Southern and Eastern European) countries. This could affect the regional viability of climate brokerage companies. Also, the climate services market for DRR is different between countries, because of different hazards, different actors involved and different levels of awareness.
- Four ways of improving the provision of climate services are suggested: (a) develop and advertise good practice examples (showcases, successful business cases), (b) develop a quality assessment and control system for climate services, (c) develop capacity to provide tailored services, including data, indicators and tools, and (d) taking a broad perspective on climate services, e.g. including non-climate information (vulnerability, exposure) and supply chain vulnerability.

Q2 What should the relationships between C3S and other programs (national and international, public and private sector) be and how could they be best harmonised?

- It is important to create platforms (learning networks, Communities of Practice) where climate service providers can meet, share experiences and learn. C3S could stimulate this in collaboration with other programmes, both at the national and international level. Harmonisation of (meta) data, methods and tools could be an important focus.
- C3S should connect not only to programmes, public and private sector institutions dealing with climate change, but also with disaster risk reduction (e.g., civil protection).

Q3 What type of information and/or knowledge can CS add value (e.g. increased competitiveness) to stakeholder activities?

- Four ways of improving demand are mentioned: (a) make assessment of climate risks and response measures obligatory (legally required), (b) standardise methods for operations and design (e.g., ISO), (c) require disclosure of climate risk information for investments, e.g. for companies to get loans or insurance by the financial sector, and (d) promote climate-resilience and climate-friendliness as a reputational issue.

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