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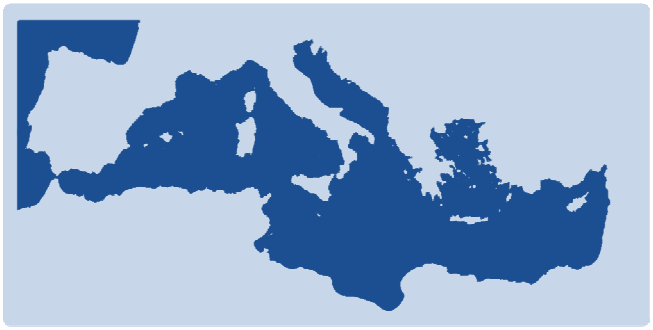

CLIM-RUN

Climate Local Information in the Mediterranean region Responding to User Needs

WP 8 – Integrated Case Studies
Task 8.1 - Organization of periodic meetings and surveys

Deliverable Title

Deliverable 8.1 - Workshop report: context and objectives, comparison of data supply and demand, simulation results, feedback and discussion.
Integrated case study: Veneto and Friuli Venezia Giulia, Northern Adriatic Sea, Italy

Project No. 265192– CLIM-RUN

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1. Introduction

Main objectives of this Work Package is "to analyse the need of climate information and the effectiveness of climate services for the integrated assessment of climate change impacts on coastal zones at the regional to local scale" (from the Description of Works). To achieve this objective end-users of climate information and risk assessments, named stakeholders in this research, will be consulted. Specifically, stakeholders considered here are representative of those public institutions which have a mandate for Integrated Coastal Zone Management (ICZM) (see Deliverable 1.1). The geographical area taken into account is the coastline of the two Italian regions of Veneto and Friuli Venezia Giulia (North Adriatic Sea).

For the purpose of this study the definition of ICZM used is that found in the EU Protocol on Integrated Coastal Zone Management in the Mediterranean (4.2.2009):

> Article 2 (f):
> *'integrated coastal zone management' means a dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts.*

Sectors of reference therefore include all those public offices that have a mandate according to the above definition, which are identified in the EU Recommendation (6.6.2002):

> Chapter III:
> - "*sectors such as: fisheries and aquaculture, transport, energy, resource management, species and habitat protection, cultural heritage, employment, regional development in both rural and urban areas, tourism and recreation, industry and mining, waste management, agriculture and education;*
> - *cover all administrative levels;*
> - *analyse the interests, role and concerns of citizens, nongovernmental organisations, and the business sector;*
> - *identify relevant inter-regional organisations and cooperation structures, and*
> - *take stock of the applicable policy and legislative measures*".

In this Deliverable we report the results of the first workshop, held in Venice on 13 September 2011, and we also report the results of the questionnaire, which was filled in online in the weeks following the workshop. Further consultations are scheduled according to the agreement reached at the end of the workshop, they enable continuous exchange between the CLIM-RUN researchers and the stakeholders. A final workshop is scheduled for February 2013.

2. The CLIMRUN workshop

The workshop for the integrated case study considering the Italian coast of the Northern Adriatic Sea, namely the Veneto and Friuli Venezia Giulia Regions, was held in Venice on 13 September 2011, in a meeting room of Ca' Foscari University of Venice. The workshop was held in Italian.

Figure 1 View of the Grand Canal from the meeting room where the workshop took place.

Out of the forty offices selected, twenty six responded positively to the invitation, showing interest and willingness to participate and appointed a person to participate to the workshop. Unfortunately six of these could not attend the workshop, because of prior commitments. Nevertheless, they gave availability and should therefore be contacted in future phases of the project. The list of the 20 stakeholders who attended the workshop can be found in <Table 1>.

Participants invited to the workshop were chosen among a list, where all local public offices with mandate on Integrated Coastal Zone Management (ICZM) have been identified according to EU "Protocol on Integrated Coastal Zone Management in the Mediterranean" (2009). It is important to say here that we considered stakeholders those who will be end-users of climate services. It is also fundamental to note that in this Work Package (i.e. WP8) climate services are considered in a broad sense as they can provide (1) basic climate parameters (e.g. precipitations, winds, extreme event frequency and intensity) through climate observations and scenarios used and implemented by climate experts; and (2) derived parameters (e.g. climate change impacts and risks assessment on natural and human systems) supplied by environmental risk experts (Figure 2).

The selected public offices were forty. Details on the criteria and method used for the selection of the participants are described in Deliverable 1.1.

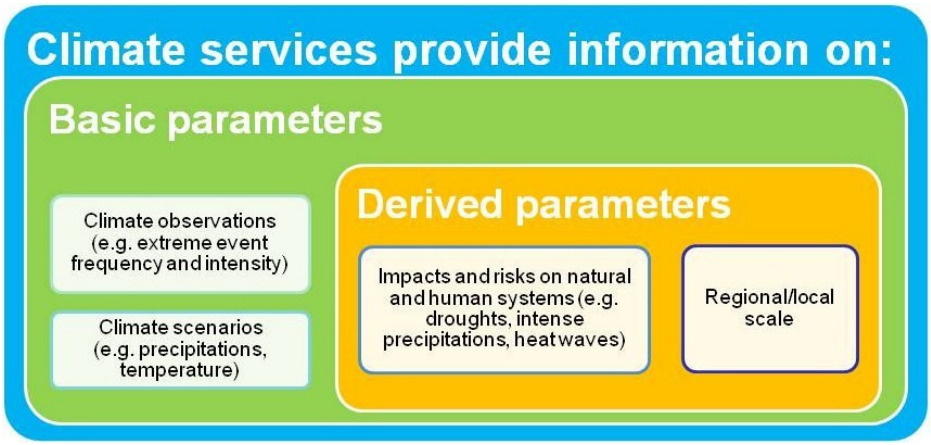


Figure 2. Climate service information in the Work Package 8.

The agenda of the day was divided into two sessions:

1. Morning session: presentations by task force team;
2. Afternoon session: discussion with participants.

At the beginning of the morning session the agenda (see <**Annex: agenda**>) was illustrated along with the workshop objectives by Valentina Giannini. Valentina Giannini also briefly described the process for the stakeholder selection, and how the involvement of stakeholders will be carried out both in this workshop and in future collaborations, pointing out that the final part of the workshop will be dedicated to discuss single stakeholders' interest to take part in follow up activities, and, if there is time, to compiling the questionnaire.

Following this, Silvio Gualdi presented the CLIM-RUN project and defined what is meant by climate services. Silvio Gualdi talked about the general concept of climate services, which refers to the task of enabling stakeholders to make use of climate information in the most effective way, tailoring information to user needs, communicating the importance of climate information and of uncertainty. For this to take place collaboration between researchers (i.e. "producers" of information) and stakeholders (i.e. "users" of information) has to be established. Primary objective of CLIM-RUN is, in fact, to establish a protocol to enable this collaboration, to strengthen the scientific base and produce data which is tailored to stakeholders needs, to test this protocol in selected case studies in the Mediterranean basin.

Then the participants were asked to present themselves by stating not only where they work, but also what kind of climate and meteorological data they already use. The statements of each participant have been recorded with the aid of a freeware called Cmap, and later exported in a Word document.

The morning session then entered its core phase: three half hour long presentations. The first two were given by Filippo Giorgi. The first was more general in scope giving information on climate change, talking about definitions, observations, models and future scenarios. Data was shown which demonstrates unequivocally that climate is changing, and that the cause is anthropogenic.

Figure 3. Workshop presentations

The second was specifically designed to give relevant information on scenarios of climate change in the Mediterranean. Filippo Giorgi showed the results of many combined models, which all show similar trends, some of which are already confirmed by observations:

- models show robust signs of climate change for the Mediterranean
- the most relevant signal is a strong warming associated to a strong reduction of spring/summer precipitations
- increase in heat waves and soil aridity
- increase in precipitation intensity (Alps and Northern Mediterranean Basin)
- sea level rise
- increase in inter-annual variability

The last presentation was given by Silvia Torresan, in it she talked about tools and services to define impacts from climate change in coastal areas. Specifically, she pointed out that climate services can provide two main streams of information: (1) basic climate parameters (e.g. precipitation, temperature, extreme event frequency) given by climate experts, and (2) derived parameters (e.g. impact and risk assessment on natural and human systems) supplied by environmental risk experts. In particular, the second group of information can include conceptual frameworks about the cause/effect relationship between climate related hazards and natural and human receptors; indicators representing the degree to which each receptor may be vulnerable or at risk from different climate change impacts; multi-scale GIS-maps providing the spatial distribution

of climate change vulnerabilities and risks in the examined coastal territory. Finally, she expressed the importance of Decision Support Systems (DSSs) that facilitate climate change impact and risk assessment in order to support decision making processes for the implementation of adaptation strategies and presented the DEcision support SYstem for COastal climate change impact assessment (DESYCO) as an innovative tool to bridge the gap between climate data and user's needs.

Starting the afternoon session we proposed a change in the organization to leave more time for the discussion, which was gladly accepted by everybody. Therefore the participants were asked to quickly review the questionnaire, which would then be filled online, and only ask questions for clarification. The discussion session then took the rest of the afternoon, and it was concluded by agreeing to a road map which will guide and organize future consultations. This discussion was moderated primarily by Silvio Gualdi and Filippo Giorgi, establishing thus since the beginning of the collaboration, a direct dialogue between the two sides represented: the climate scientists and the stakeholders. Valentina Giannini, Silvia Torresan and Valentina Gallina also facilitated the discussion, each contributing with respect to her own role and knowledge.

Table 1 Stakeholders who participated in workshop

LEVEL	INSTITUTION	NAME	CONTACT
Supranational	Euroregione Adriatica	Mauro Stefani	mauro.stefani@regione.veneto.it
National	ISPRA VENEZIA	Ing. Maurizio Ferla	maurizio.ferla@isprambiente.it
	Civil Protection, regional office FVG	Claudio Liva	livaclaudio@gmail.com
Veneto Region	Genio Civile di Rovigo	Ing. Guido Selvi	guido.selvi@regione.veneto.it
	Difesa del suolo	Daniele Piccolo	daniele.piccolo@regione.veneto.it
	Sistema idrico integrato	Fabio Strazzabosco	fabio.strazzabosco@regione.veneto.it
	ARPAV Centro meteo Teolo	Adriano Barbi	abarbi@arpa.veneto.it
Independent Authorities	Magistrato alle acque di Venezia	Alfredo Riondino	riondino@magisacque.it
	Consorzio Venezia Nuova	Stefano Libardo	stefano.libardo@consorziovenezianuova.com
	Consorzio di Bonifica Delta Po	Ing. Stefano Tosini	stefanotosini@bonificadeltadelpo.it
	Consorzio di Bonifica Veneto Orientale	Graziano Paulon	graziano.paulon@bonificavenetoorientale.it
	Port Authoritiy of Venice	Erika Rizzo	erika.rizzo@port.venice.it
Provinces	Venezia: Servizio geologico e difesa del suolo	Valentina Bassan	valentina.bassan@provincia.venezia.it
Municipalities	Venezia	Sandro Caparelli	sandro.caparelli@comune.venezia.it
	Venezia: Istituzione Centro Previsioni e Segnalazioni Maree	Alessandro Tosoni	alessandro.tosoni@comune.venezia.it
Friuli Venezia Giulia Region	Servizio geologico	Antonio Bratus	antonio.bratus@regione.fvg.it
	ARPA	Pietro Rossin	pietro.rossin@arpa.fvg.it
	ARPA	Isabella Scroccaro	isabella.scroccaro@arpa.fvg.it
	ARPA OSMER	Stefano Micheletti	stefano.micheletti@meteo.fvg.it
Parks	Area Marina Protetta di Miramare	Roberto Odorico	roberto.odorico@shoreline.it

3. Main results of workshop

Generally speaking all the stakeholders who came to the workshop showed interest in the theme of climate services, willingness to learn, and contribute opinions. They followed all the presentations very carefully and asked questions for clarification. Moreover they not only declared since the beginning the availability to keep cooperating, but also in the very last part of the discussion they proposed effective tools to enable dialogue using the internet.

The original statements of the participant were in Italian: they have been recorded using the Cmap freeware (http://cmap.ihmc.us/). They have been summarized and translated into English, and are presented below in the following paragraphs of this section. A document has also been produced and distributed to the stakeholders in Italian, to briefly summarize the results of the workshop, focusing on the further steps which have been agreed to at the end of the meeting.

The following 5 paragraphs (**3.1**; **3.2**; **3.3**; **3.4**; **3.5**) report exclusively the opinions as expressed by stakeholders, organized in paragraphs, which are coherent with the objectives of this Deliverable, the questions asked during the workshop and the themes that emerged during the workshop itself.

3.1. Interests and themes

Specifically, with respect to the given definition of climate service, the stakeholders expressed interest regarding the evolution of climate in the future, i.e. how the trends of the most common parameters used to describe our climate will change (e.g. temperature and precipitation trends). There is mainly a request for information to describe sea level rise, tides, and precipitation, especially when relative to those extreme events that cause flooding or other damage. The request includes information on the return periods of extreme events. Even if there is understanding that in the future the problems might be different, smaller concern was given to other extreme events such as droughts or heat waves.

The impacts of these climatic changes have also been identified as issues of concern for natural resources. These include:

- hydrogeological disturbance,
- coastal and beach erosion,
- saltwater intrusion,
- drinking water availability,
- biodiversity loss,
- forest fires.

The impacts, which will be felt on natural resources, will therefore also impact some economic sectors, in this case mainly tourism, agriculture, fisheries, and shipping, and more generally all the sectors, such as urban planning and infrastructure, where decisions regarding land use should be made.

We can also say that there is awareness of the fact that climate change will require both mitigation and adaptation measures to deal with these impacts.

3.2. Use of information

The discussion on the usefulness of climate information needs to be started by highlighting two themes: (1) the scale at which this information is given has to be regional/local, e.g. maps and outputs provided by models need to be drawn at the local scale; and, (2) especially thinking about the tourism sector, environmental sustainability needs to be at the centre, thus going beyond climate change.

Specific importance was acknowledged in the use local meteorological data (provided by meteorological stations of Veneto and Friuli Venezia Giulia) in order to (1) improve the models provided by the CLIM-RUN project, and (2) give an uncertainty estimation. Moreover the use of local topographic data (e.g. Digital Elevation Model at 1 meter resolution) in order to provide risk assessment tools (e.g. maps, indicators) at local scale is necessary.

The main issue discussed was urban planning and the fact that floods happen because the climate factor is no taken into account: there is lack of information to support planning decisions. Collecting information which could trigger prevention measures, such as specific studies on hydrogeological risk and coastal erosion, attention should be paid not only to observed and recorded events, but also, to future events. In fact, if little attention is paid to historic information, no attention at all is paid to what future climate change will bring. This information should inform decisions, which will enable disaster prevention or, at least, will decrease negative impacts.

Besides planning, other sectors use climate information to design and manage according to their mandate. For example land reclamation boards need information for the design and maintenance of levees, canals, and pumps. Currently, in fact, the problem is often too much water, so water needs to be taken away quickly. In the future, however, the expectation is we will go towards water scarcity, thus we need to plan ahead to be able to change and address this issue. Another use is for the sizing of the drainage system to prevent local hydraulic risk.

Moreover, coastal defence design is changing, because of longer lasting storm surges, which are destroying coastal dunes. For adequate coastal defence data is needed, which takes into account climate change: observed data is not accurate anymore to design defences, baseline data is proven wrong by events.

Climate change will have impacts on natural resources and thus their management should take this into consideration. This is the case of fisheries where species composition has already been observed to change (e.g. “warm” species are now found in places where only “cold” species where found before), and thus changes might be needed to be able to catch the available species.

Monitoring meteorological events is also needed mainly for civil protection decisions. It is the case for early warning systems, which need real time data communicated effectively to be able to act early, decreasing casualties and damage as much as possible. It is also the case for forest fires, where weather forecasts are used to move vehicles where they could be needed most in advance of fires, to be better prepared to extinguish them.

Last but not least, an example of the usefulness of climate data was given. After some research comparing historic databases with future scenarios, a fire brigade in the United Kingdom was recommended to switch to smaller trucks and a more flexible structure.

3.3. Expectations

The greatest expectations in coming to the workshop for stakeholders were related to the possibility of learning more about future climate scenarios, about models and tools for their assessment, and about the level of uncertainty in models and in tools. In fact, those stakeholders who already provide meteorological data are receiving information requests, coming both from the general public and from specific sectors, about how we will be affected by future climate change.

The issue of extreme events seems one of the most interesting: monitoring and modelling efforts are expected to clarify and demonstrate the possibility of predicting extreme events. A few hoped to learn that there is the possibility of having longer weather forecasts (e.g. from 10 days up to one year, but their enthusiasm was soon curbed: it is not possible to have a one year forecast) to improve their decision making. Nevertheless expectations have been also arisen as to how to carry out a more effective monitoring.

A final group of remarks highlighted the need to create a network to enable collaboration, share knowledge and data, and improve communications on impacts of climate change making it more effective. Knowledge, data, and methods could be shared in a network of researchers and end-users so that outcomes of research reaches who needs it: it is important in the CLIM-RUN project to create and maintain a link between researchers (climate experts and environmental risk experts) and stakeholders. Most importantly, some of the participants offered their data to the CLIM-RUN project database.

3.4. Meteorological condition monitoring and weather forecasts

The monitoring of meteorological conditions is currently carried out through a network of stations: observed data are available, and stakeholders in the workshop are available to provide them. Monitoring includes both atmospheric and marine conditions, some examples are: tides, currents, winds, pressure, temperature, conditions in the Lagoon of Venice, tsunami in Southern Adriatic Sea. The network of monitoring stations is able to provide real time data.

However, monitoring capabilities should also be developed further. Some specific requests were voiced during the workshop. Even if they should not be considered a definitive and comprehensive list, they offer good food for thought. Some of them relate to the monitoring of environmental conditions, which will be impacted by climate change, and are already impacted by climate variability and human use, they include: surface water monitoring, water table monitoring, and parameters that can be used to describe climate change. Monitoring could also be improved to be better able to assess biodiversity and species composition, especially when it regards commercial fish species. A specific request concerns the Po Delta: currently below sea level, there is worry about what will happen with sea level rise and possible increase in storm surges.

Availability of weather forecasts is currently judged as satisfying, even if ten days forecasts (and possibly longer) would be more than welcome. They provide information on the same parameters that are monitored, some examples are: tides, currents, winds, pressure, temperature, precipitation.

Some improvement is, however, needed, especially on heavy precipitation (divided in rain and snow), and dry spells. Heavy rain forecasts, in fact, are necessary for early action by the Civil Protection, and by the water authorities, who are in charge of distributing drinking water: the last flood has stopped water delivery plants for nine hours. On the other hand, dry spells are important to forecast for irrigation purposes. Weather forecasts longer than three days would help in fighting forest fires: having information in advance would make moving vehicles where they could be needed easier.

An important fact should close this section: the need to create a link, now totally missing, between meteorological data, especially extreme events, and impacts caused by them, e.g. floods and landslides.

3.5. Future climate change scenarios

Much interest was voiced, as described in the previous paragraphs, to the topic of climate change. A basic question was asked: "is what we experienced in the last years climate variability or climate change?"

Moreover, several of the participants identified specific needs in relation to their own mandate. This brings about the need for data on future scenarios of climate change in general, and evolution of trends, specifically those relative to extreme events. The most relevant use of climate information is for urban planning, for disaster risk reduction, and for hydrogeological risk assessment. For these activities a ten year scenario could be enough. Future trends of parameters are what engineers and geologists need. Medium to long term climate scenarios are needed to understand population dynamics in water bodies and water availability.

In relation to the specificity of the topic, coastal zones, stakeholders requested information to understand future change of marine conditions. Since sea level rise has been already observed, the request is for future scenarios of sea level rise, which are needed to be able to cope with them. Now the horizon is 48 to 72 hours, longer horizons are needed to implement adaptation strategies, for the early warning system, to manage the MOSE[1], and in shipping. The question is: "among all available scenarios, which is the most likely future scenario?"

More generally, the issue of climate change is important in relation to the wider picture of resources allocation, both monetary and natural. The first example is the budget cuts local administrations are facing because of the economic crisis and the Italian government budget: these constrain choices and force reallocation, which should be carried out in a decision making environment, which integrates different kinds of information, which should include climate information. Talking about the politic agenda, cross border relationships have to be taken into consideration: water resources or fisheries straddling across borders are the most immediate example.

Lastly one stakeholder specifically asked that opportunities arising from climate change, such as the expansion of the economic sector based on solar energy technology, should be identified.

[1] Modulo Sperimentale Elettromeccanico (MOSE) is a mobile barrier system which is being built at the inlets of the Venice Lagoon, it should close the lagoon when acqua alta (high waters) is forecast.
http://www.consorziovenezianuova.com/uk/default.htm

4. The CLIM-RUN questionnaire: main results

A questionnaire was developed within the WP4 in English, and then translated into Italian and made available to stakeholders online through the Google platform (www.climrun.eu/questionario). Some questions were added to the original format of the questionnaire in order to collect stakeholders opinions about derived climate parameters (i.e. climate impact and risk assessments) according to the specific objectives of WP8. The questionnaire has been divided into 5 sections: (1) your institution/organization, (2) risk perception and current use, (3) your perspectives on climate services, (4) data requirements, (5) handling uncertainties. Thirteen out of the twenty stakeholders who participated to the workshop answered the questionnaire, so in the discussion below we will indicate in parenthesis how many out of 13 gave a certain answer. As a general comment, the answers show that all stakeholders have understanding of climate and weather phenomena, and of issues and problems related to them.

The first section **<Your institution/organization>** is a confirmation of the fact that all levels from local to international have been represented in the workshop. Moreover, a diversity of sectors were represented, these include water resources management, land use planning, environmental planning, risk management. Great availability for future involvement was shown: almost all stakeholders are available to participate in future activities and meetings with the research group, some are willing to give data and to test data bases and tools.

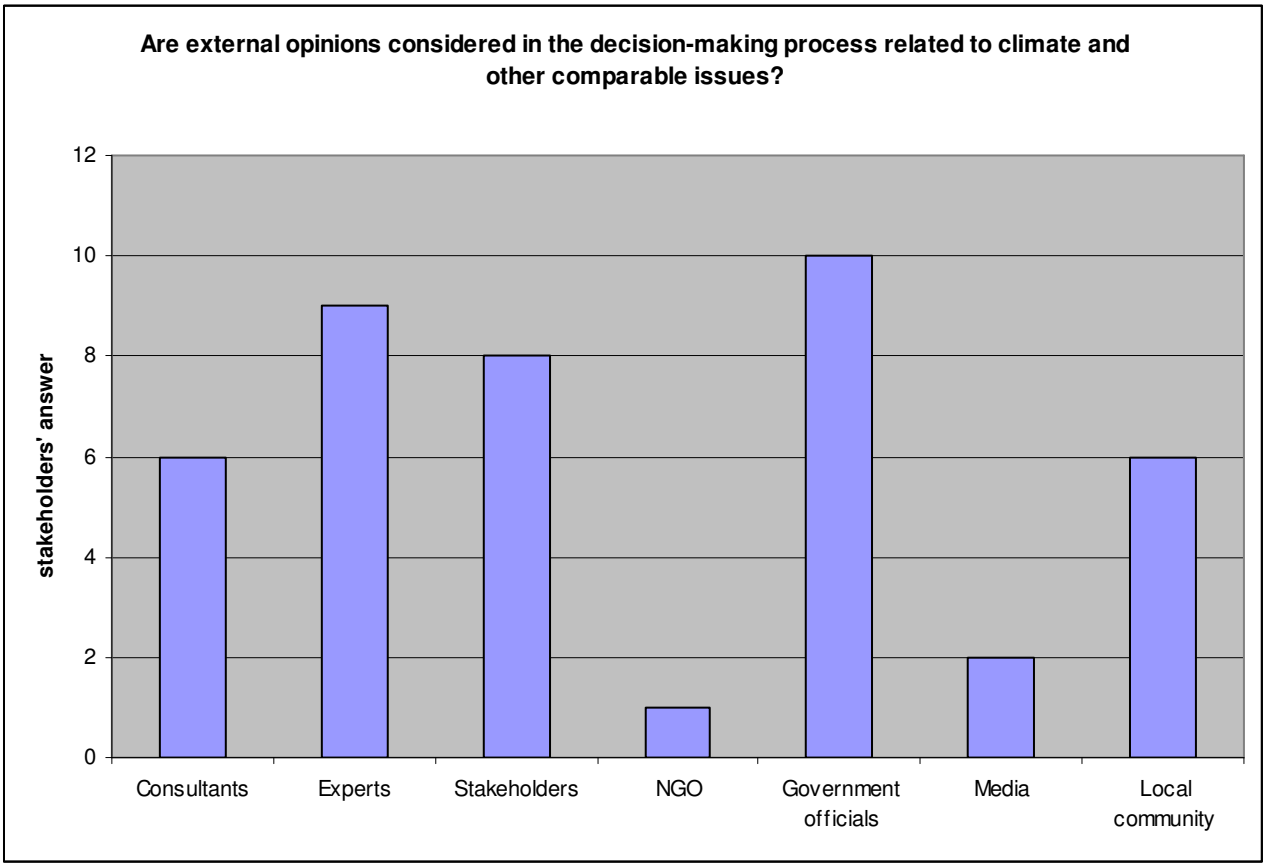


Figure 4. Sources of external opinions considered in the decision making process

With minor exceptions all stakeholders say they have autonomy in deciding what research activities to carry out. As shown in **Figure 4** sources for climate information are varied, comparing this answer to later ones, we can say that <Government officials> probably refers to the regional meteorological centres established within the regional environmental agencies (ARPA).

The data collected currently is by almost all (11/13) climate/weather data; some (5/13) collect economic data; only one social; other type of data collected are: fishery production, sea temperature, hydrogeological events, environmental.

The second section is about **<Risk perception and current use>**. The majority of stakeholders perceive their organizations as potentially risk prone (see **Figure 5**). However, probably because of the diversity of institutions represented, risk perception varies from high to low. The highest risks perceived are: coastal flooding (11/13), coastal erosion (8/13), drought, salinisation and water quality (7/13), hydrogeological disturbance (6/13).

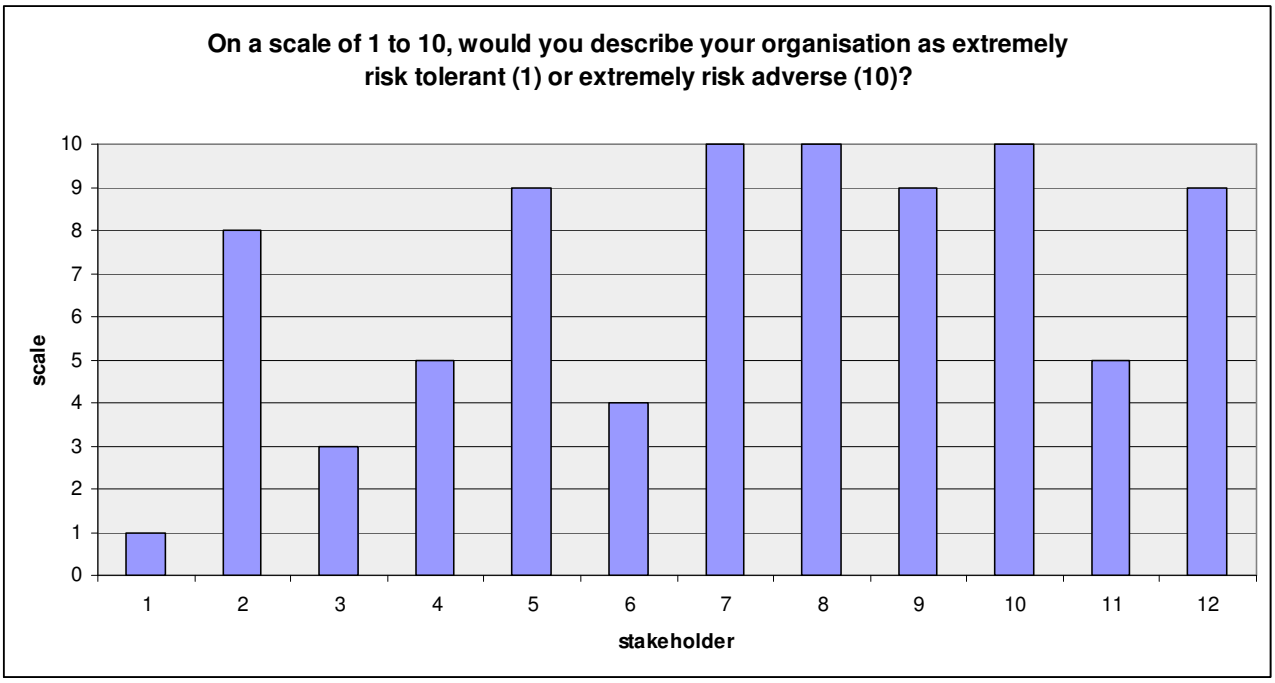


Figure 5. Risk impacting each institution

Moreover, stakeholders were asked to identify and classify the importance of coastal receptors to be analyzed in climate change impacts, risks and vulnerability assessment studies. As shown in **Figure 6**, almost all the receptors proposed in the questionnaire were considered important for stakeholders. Specifically, while <beaches>, <deltas and estuaries>, <wetlands>, <hydrological systems>, <agricultural areas> and <keystone species habitats> were considered important by at least 8 out of 13 of the interviewed stakeholders; <lakes>, <terrestrial biological systems> and <infrastructure for tertiary sector> were considered as important targets only by stakeholders ranging from 2/13 to 4/13.

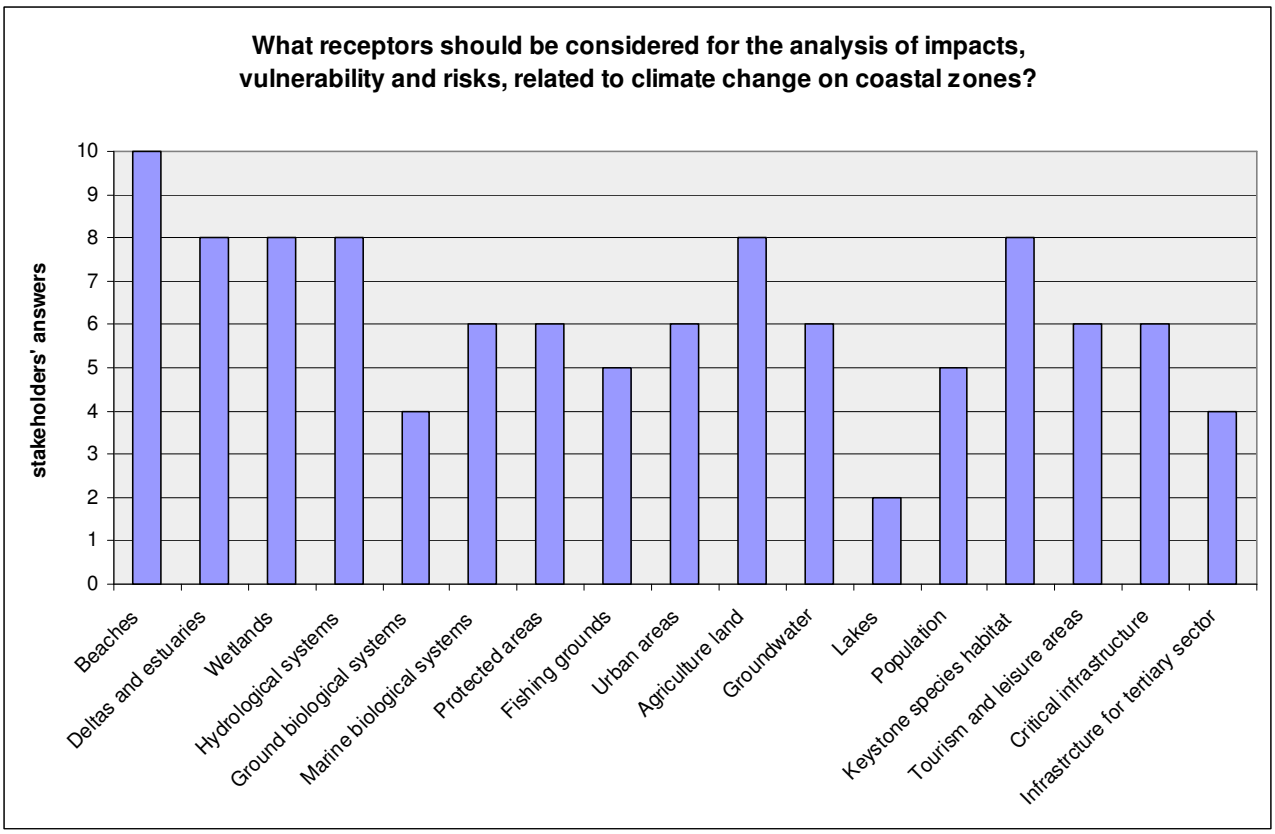


Figure 6. Ranking of the relevance of coastal receptors to be considered as targets for climate change impact, risk and vulnerability studies.

Looking into what climate related events are considered the most important, all of the stakeholders have selected <Extreme climate/weather events (e.g., heavy rainfall, high temperature, heatwaves, low temperature, drought, flood, hail); almost all (12/13) of them have selected <Increasing/decreasing trends extending over decades>; finally, roughly half consider important other types of variability (intra-seasonal, inter-seasonal, start/end /length of season) and of yearly trends.

Climate and weather information is acquired from multiple sources, mainly "internal" ones such as Agenzia Regionale per la Prevenzione e protezione Ambientale (Regional Agency for Environmental Protection, ARPA) of both regions, in accordance to what already stated above.

Climate/weather information currently is used as follows:

- <Daily weather forecasts (next 1-10 days)> is used by 11 out of 13 stakeholders;
- <Severe weather forecasts and advisory notices> and <Historical observations> are used by almost all;
- <Future climate projections> are used by a few stakeholders;
- <Seasonal forecasts> are currently not used at all.

There is widespread collaboration of climate scientists and use of climate information, which is judged satisfactory (on average 8/12); this information is used in the decision making processes of 8 out of 12 of these institutions; 9 out of 13 have no access to climate change future projections,

because of a mixture of reasons, mainly (3/8) because <Not aware of them>. All stakeholders understand the improvements in their management and/or decision making processes with respect to the specific mandate of their institution that would bring better climate/weather information.

The main result of the third section **<Your perspectives on climate services>** is represented in **Figure 7** . Most stakeholders (8/13) rate <Provision of observed climate and weather data>, <Tools for analyzing climate data> as essential. Generally, however, all of the possible answers have shown a high degree of interest by stakeholders. Stakeholders have expressed slightly lower interest towards <Training in using climate data/tools> and <Conceptual frameworks to enable cause/effect relationships>.

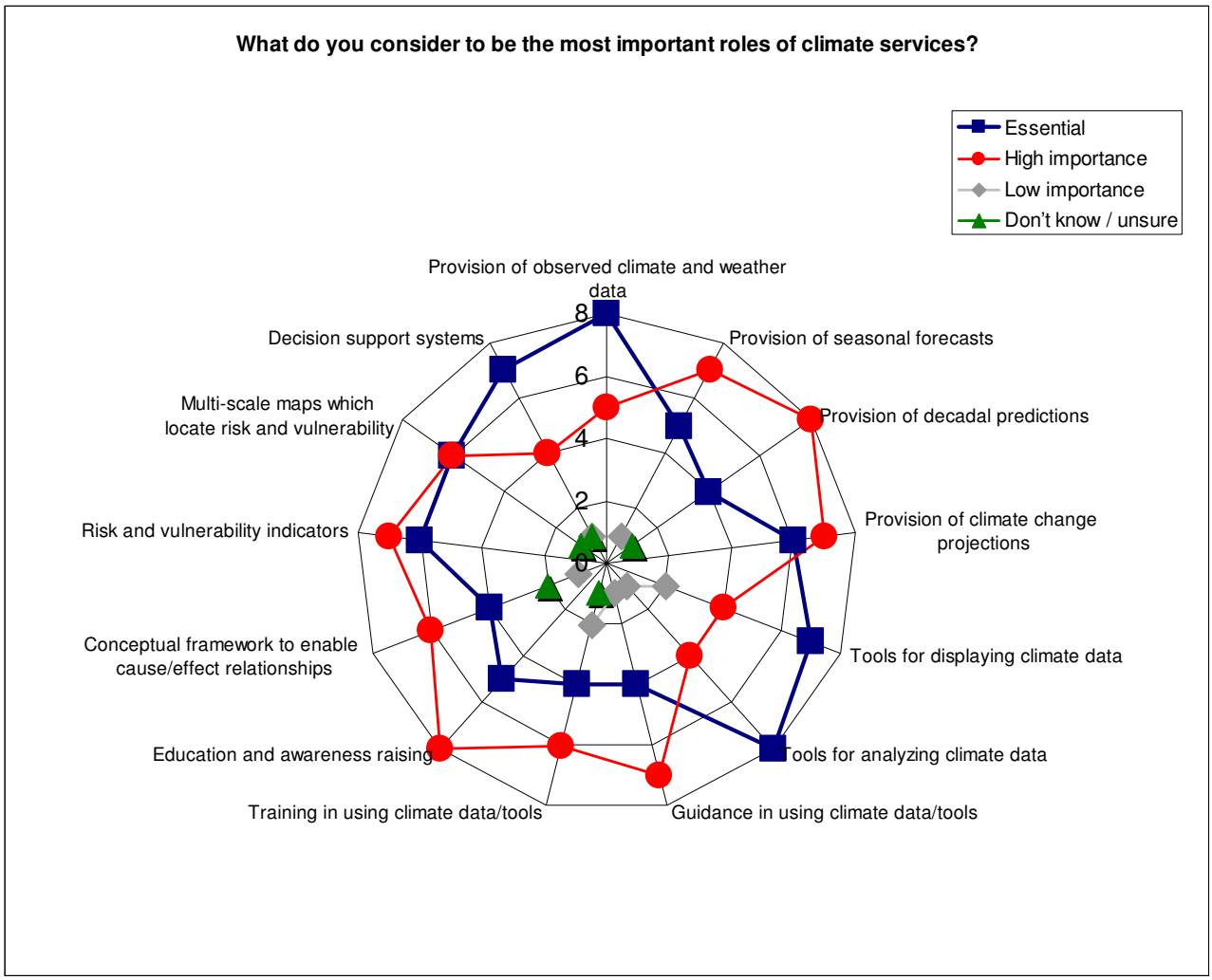


Figure 7. Roles of climate services.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

Stakeholders would use climate services for assessing impacts and vulnerability derived from climate change, developing adaptation strategies, education, and awareness raising within their professional field. Moreover, having little or no knowledge of climate models, they are interested in learning, especially for what concerns local/regional models, and for this some suggest to create a network of users and modellers (as described in **3.3**).

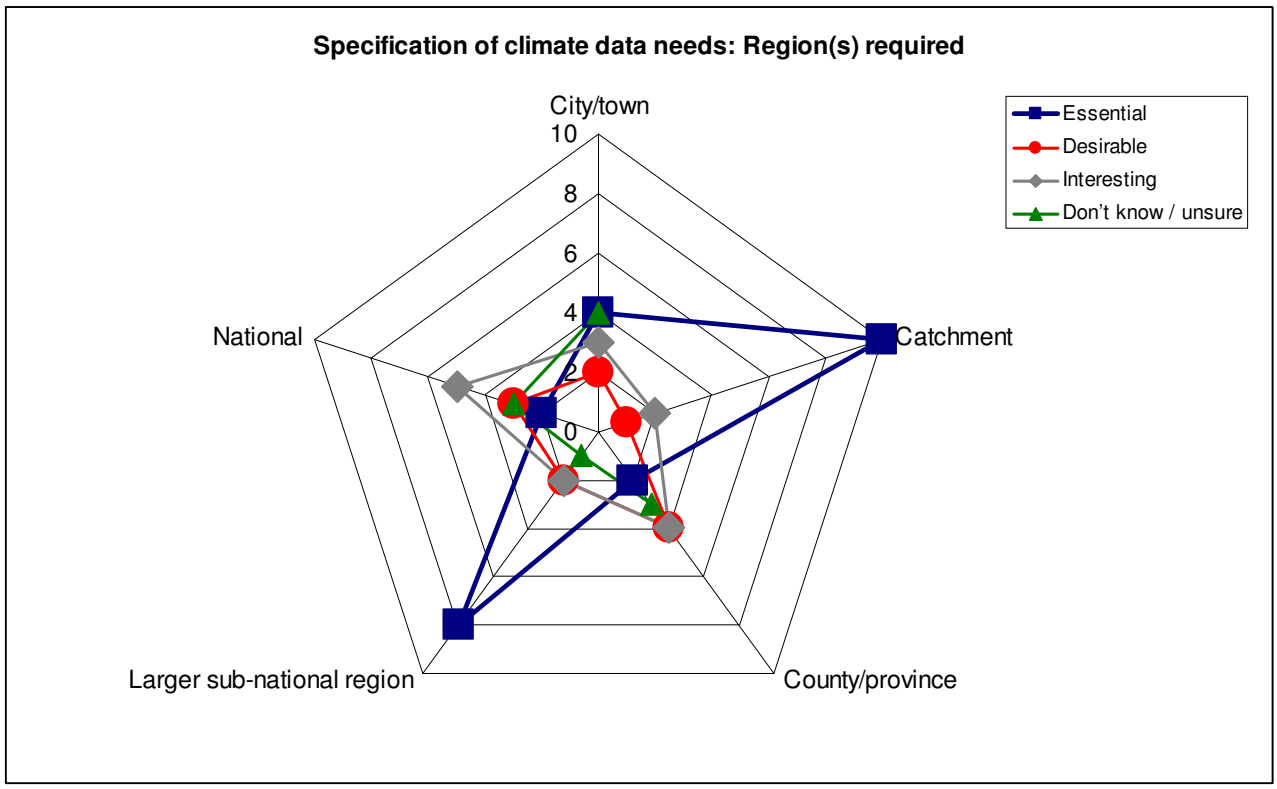


Figure 8. Regions required. Numbers in the radius represent the number of stakeholders that selected that answer to the question.

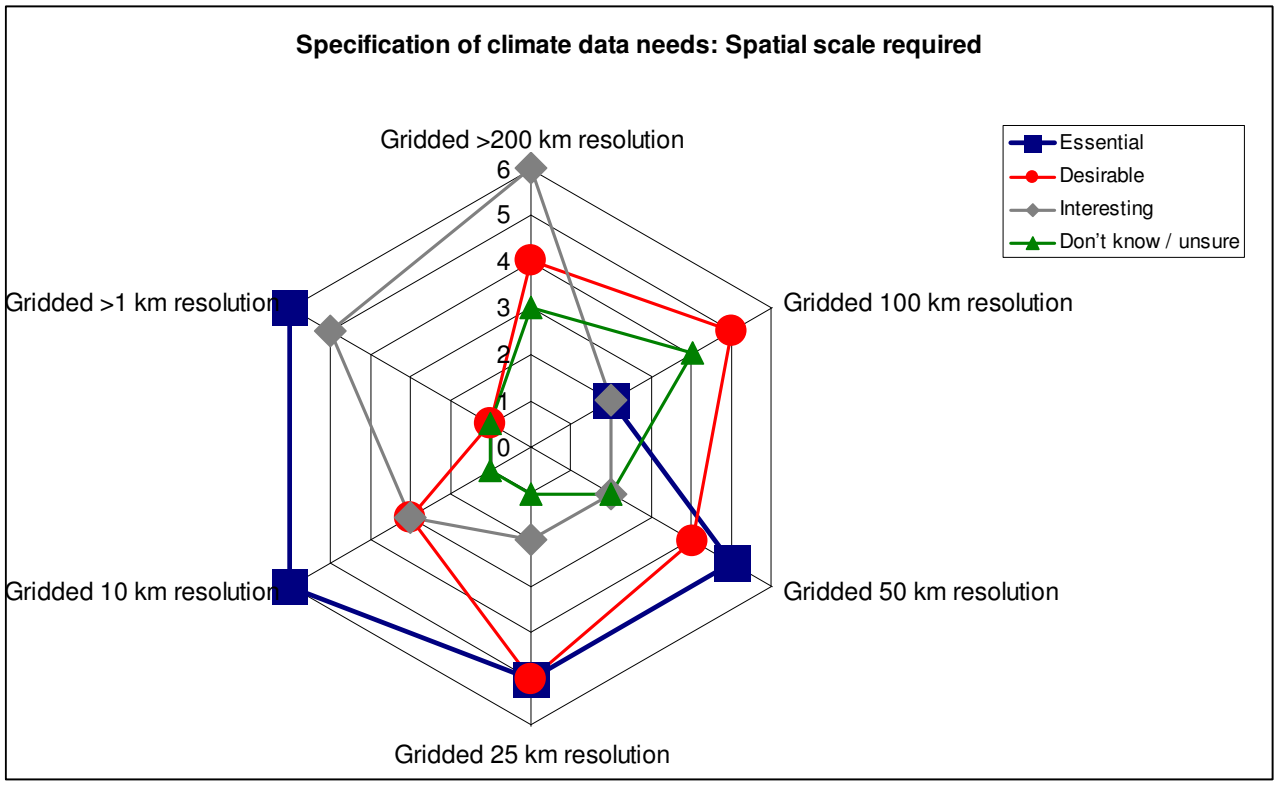


Figure 9. Resolution required.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

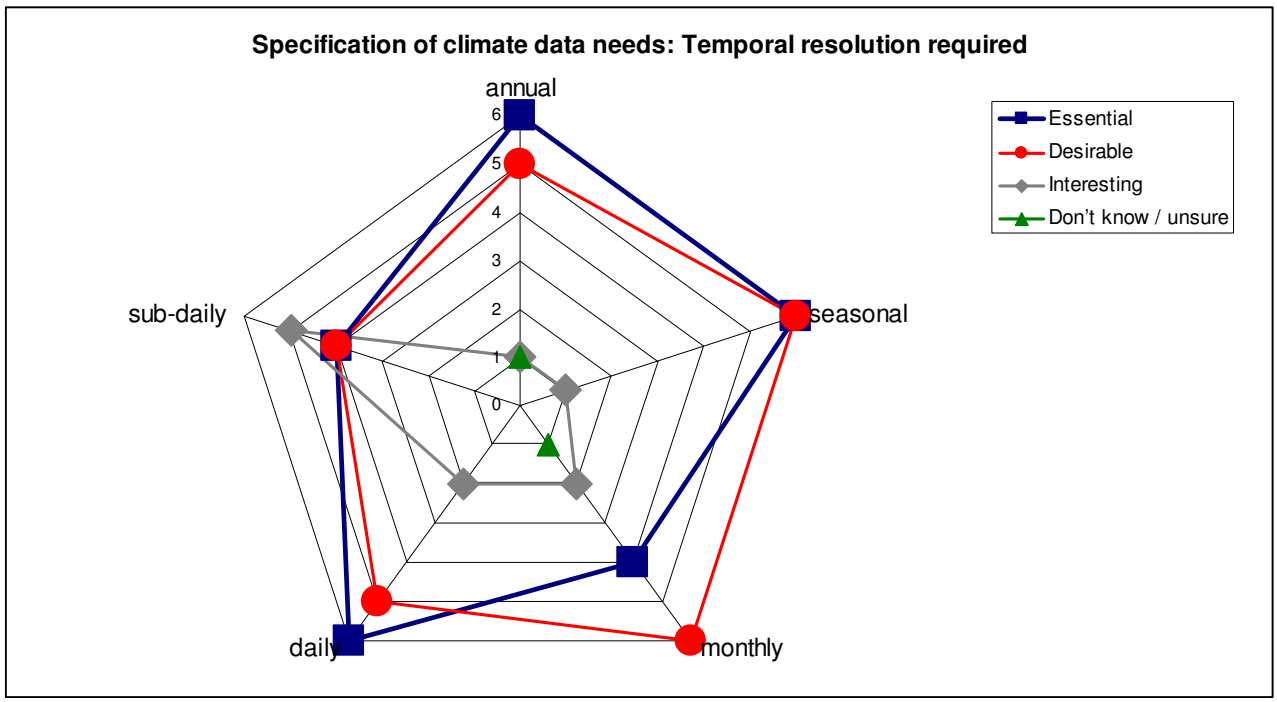


Figure 10. Temporal resolution required.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

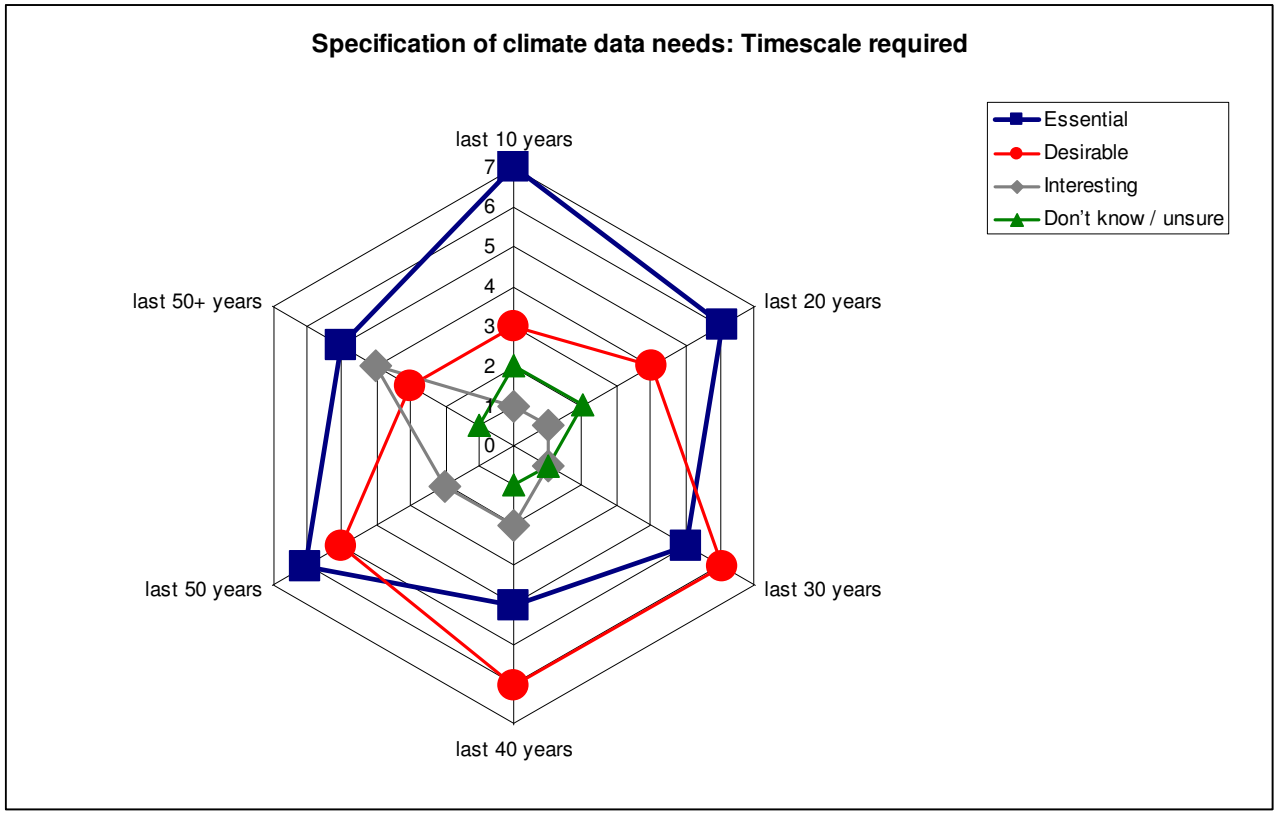


Figure 11. Time scale required.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

More specific information is found in the fourth section **<Data requirements>**. Combining the information derived from two questions (shown in **Figure 8** and **Figure 9**) we can say that the information is requested at a catchment to sub-national region, at a medium (50 km) to fine (1 km) resolution.

Looking at the <Temporal resolution required> (see **Figure 10**) and the <Time scale required> (see **Figure 11**) all possibilities given (Temporal resolution required: annual, seasonal, monthly, daily, sub-daily; Time scale required: from last 10 years to last 50+ years) answers have been judged either <Essential> or <Desirable>, i.e. the two most important categories, by nearly all stakeholders (ranging from 8/13 to 12/13).

Looking at the time horizon (**Figure 12**), projections for the next 10 or 20 years are judged mostly <Essential> to <Desirable>, while <Desirable> is the category selected by 30 to 50 years almost by all (10/13) and 50 years and over by fewer (6/13).

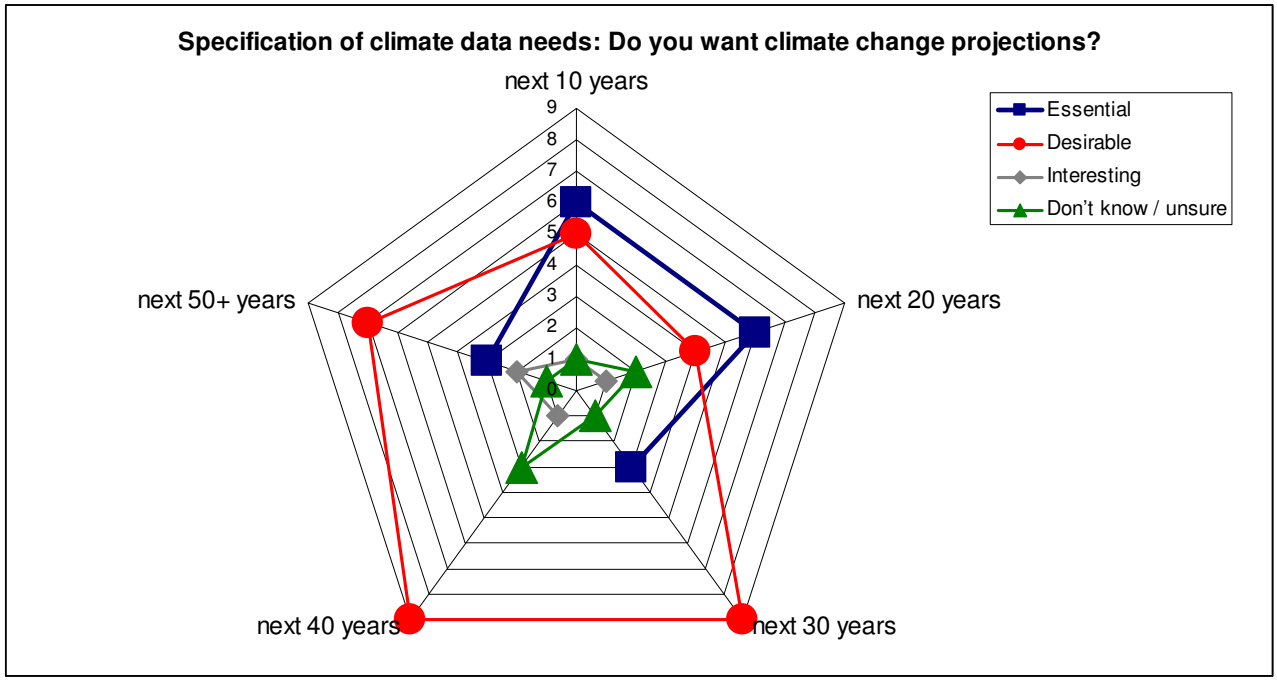
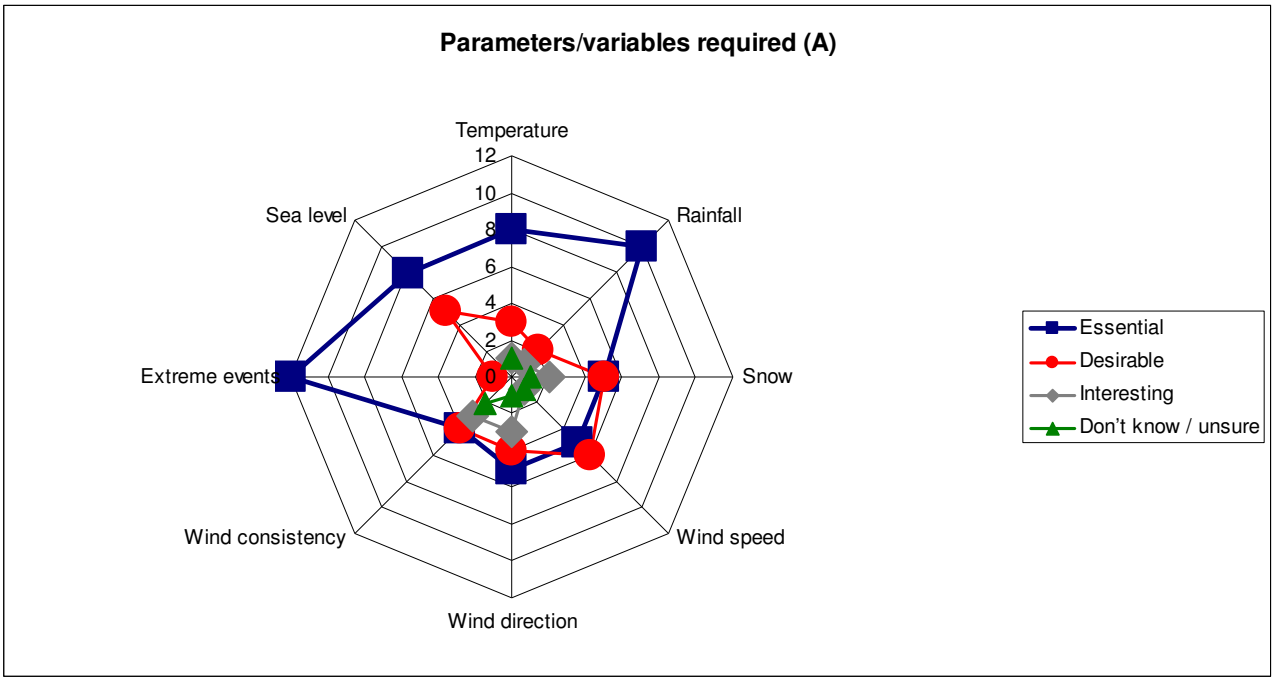


Figure 12. Climate change projections.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

Looking into what types of parameters are requested (**Figure 13**) four parameters have been selected the most <Temperature>, <Rainfall>, <Extreme events>, and <Sea level>; a fifth parameter is also judged of relevance <Wave height>. Other parameters of interest not listed among the questions, which have been added by stakeholders, are: forest fires, spatial distribution of rain events, and drought.



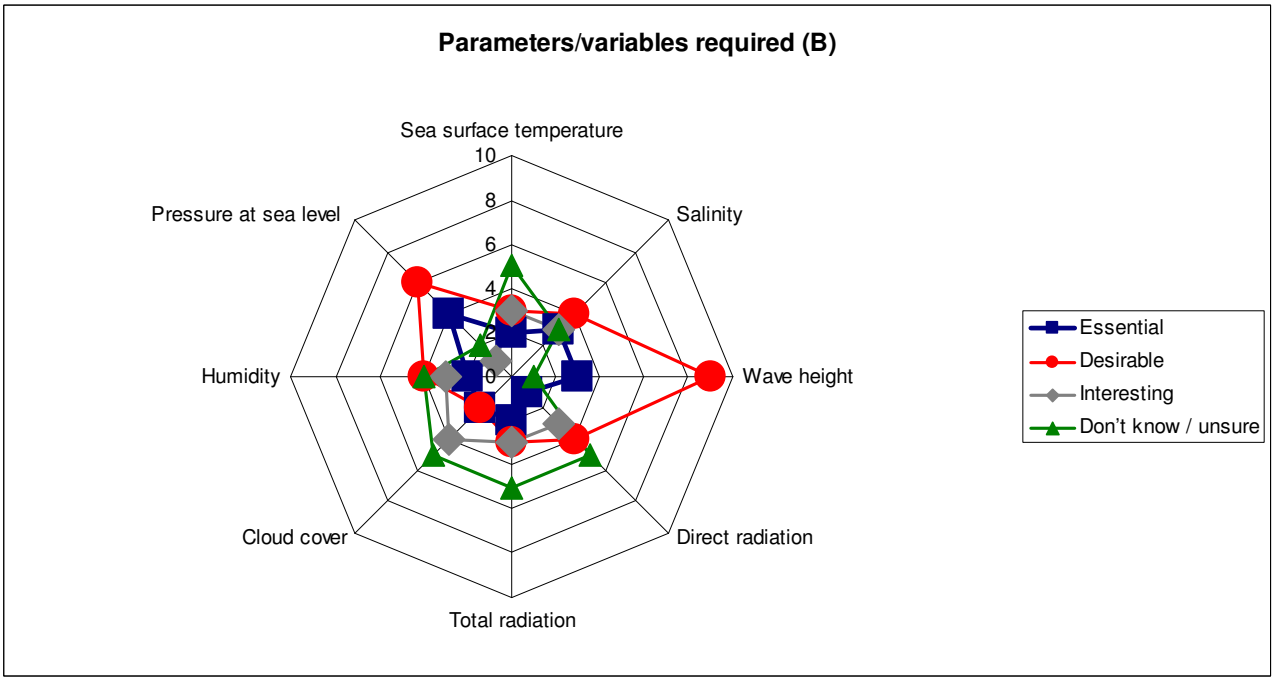


Figure 13. (A) and (B) Information required: parameters/variables.
Numbers in the radius represent the number of stakeholders that selected that answer to the question.

Data formats required include all of the proposed: time series, statistical distributions, and maps. Preferred data formats are in order:

- .xls (10/13)
- text files and GIS (8/13)

Further steps in this process, result of an agreement between stakeholders and CLIM-RUN researchers are:

1. Stakeholders will fill in the online questionnaire by **Friday 16 September 2011**
2. Minutes of the meeting focusing on next steps will be provided to stakeholders before the end of **October 2011**
3. Stakeholders will provide feedback on further steps by the end of **November 2011**
4. CLIM-RUN researchers will provide definitive plan for further consultation by the **end of 2011**

The future collaboration with the stakeholders will bring elements to better tailor climate services to end-users' needs. The final validation of these climate services will be carried out in the second workshop, proposed within the CLIM-RUN activities and scheduled for February 2013.

- .csv (5/13)
- ASCII (4/13)
- GRIB (2/13)
- NetCDF and Mdb (1/13)

The fifth and last section is on **<Handling uncertainties>**. The preferred option for representing uncertainties is through <Confidence estimates>; however, the other two options given, <Probability distributions> and <Multi-model means> have been chosen as well, see **<Figure 14>**.

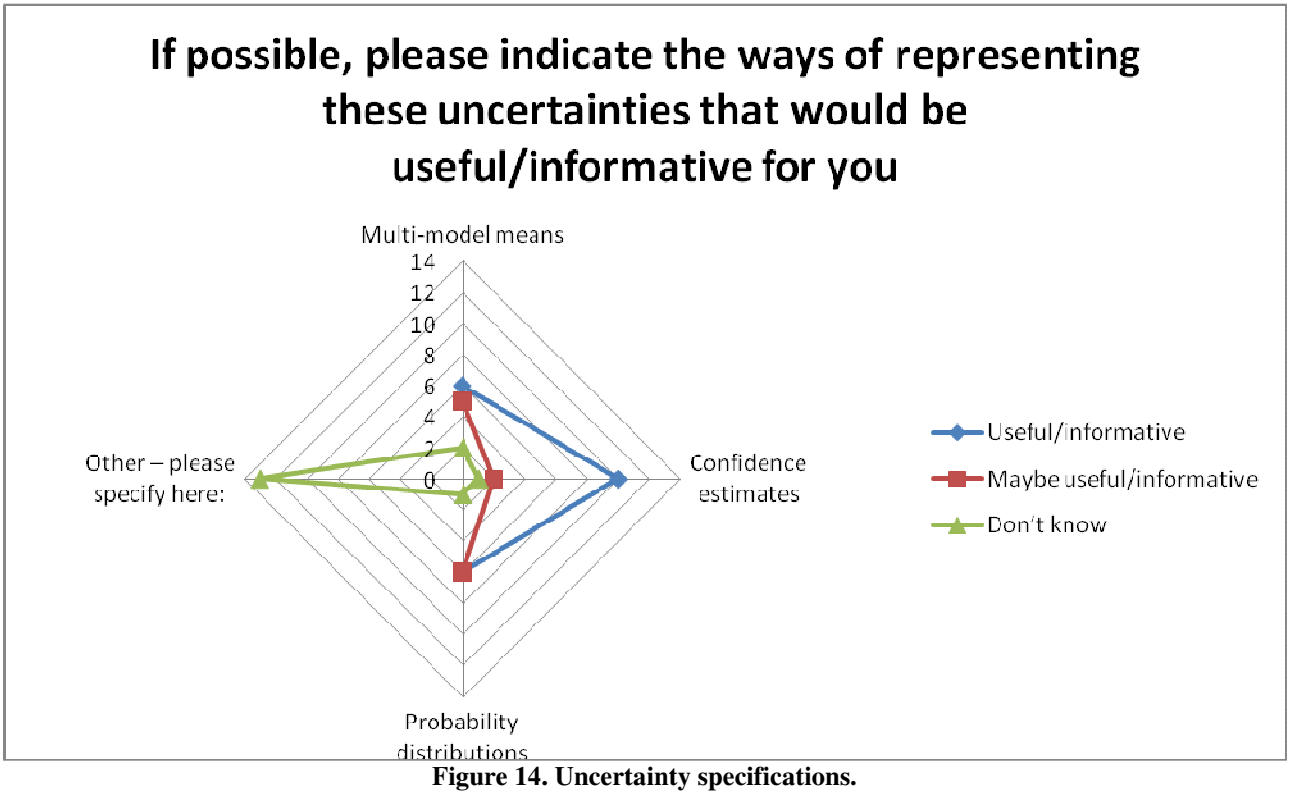


Figure 14. Uncertainty specifications.

5. Next steps

The very last part of the discussion during the workshop held in Venice on 13 September 2011 was focused on identifying a method to continue the information exchange started with this workshop. In the lively discussion the participants, as well as the CLIM-RUN researchers, have been proactive in suggesting effective ways and methods to enable collaboration. In the end three thematic groups have been created as a result of the discussion (see <**Figure 15**>). While the three groups are to be considered as definitive for future consultations, the specific data requirements listed in the third layer of **Figure 15** (e.g. precipitation, temperature, seasonal forecasts, pressure, length of period, etc.) are only to be considered examples, and will be matter of discussion in the thematic group meetings.

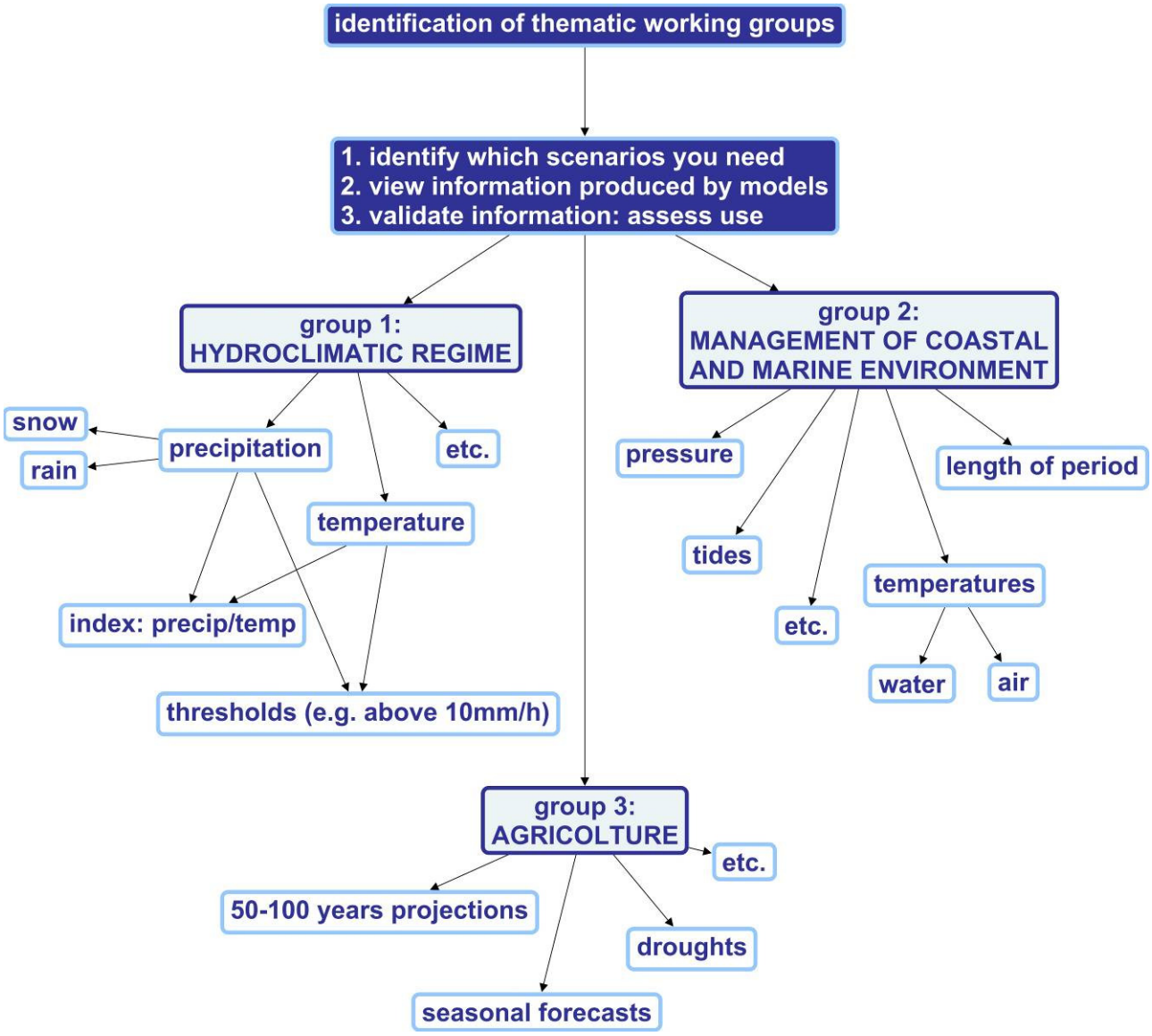


Figure 15. Hypothesis for future collaboration

Each stakeholder will decide to participate in the works of one, or more, thematic group, according to his/her interests and knowledge. The consultation process will be defined according to the number of participants in each group: specific meetings or personal discussions could be organized. To facilitate this ongoing collaboration internet resources will be taken into consideration: one of the stakeholders suggested the use of Google+.

6. Conclusive comments

Some additional conclusive remarks should be made. These bring into the question issues which, even if outside the scope of the meeting, could be addressed by the CLIM-RUN project. Firstly, the need for a "strong" document on climate change scenarios so that climate information will be considered in planning. In fact, not only data is needed to understand change and design adaptation measures to cope with it, but also attention has to be paid to improve data communication: it must be clear that there is no possibility of ignoring climate change. Proof of this is that more than lack of information the problem is, nowadays, lack of integration of climate information into the decision making process, and lack of impact and risk assessment tools, such as GIS-maps, and geospatial indicators. One issue directly related to this is the communication of uncertainty in model outcomes, which is generally an excuse for inaction, but it should rather be interpreted as a range of possibilities of what the future might be. Finally, in order to support the use of climate scenarios in urban planning and facilitate decision making processes in uncertain situations, the environmental risk experts are significant scientific figures and the Decision Support Systems (DSSs) are important tools that allow to spatially visualise the potential consequences of climate change in different natural and human systems and sectors.

7. Annexes

7.1.Annex: agenda

TIME		
10:00	**start**	
10:00	Valentina Giannini CMCC	Presentation of workshop for the involvement of stakeholders in the CLIM-RUN project
10:15	Silvio Gualdi CMCC	Introduction to the CLIM-RUN project and to climate services.
10:30	all stakeholders	Brief introduction by all stakeholders: • what is my interest towards the topic of this workshop? • what kind of climate/meteorological data do I currently use? • what are my expectations?
11:30	Filippo Giorgi ICTP	Climate change: observations, models, future scenarios Scenarios of climate change in the Mediterranean area
12:30	Silvia Torresan CMCC	Development of services and tools for the analysis of impacts and of risks deriving from climate change in coastal areas
13:00	**lunch break**	
14:00	all stakeholders all researchers	Dialogue between stakeholders and climate scientists: • thinking about specific cases and examples: what are your needs? • are current model outcomes useful for you? • what kind of scenarios do you need? • how does uncertainty in model outcomes affect your sector?
15:30	Valentina Giannini CMCC	Next steps
16:00	**end**	