



# IS-ENES2 MILESTONE (M -N°: 7.4) First review report on the ENES Earth System Model Resources CERFACS Working Notes, WN/CMGC/15/41

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## Abstract

The reviews of IS-ENES2 services on Earth System Models, model components and tools are presented in this document. The full reviews can be found in Appendices of the document. The main remarks and suggestions of the reviewer are presented with our comments on what we did or plan to do to address them.

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<b>PP</b>	Restricted to other programme participants including the Commission Services	
<b>RE</b>	Restricted to a group specified by the partners of the <b>IS-ENES2</b> project	
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## Executive Summary

The reviews of IS-ENES2 services on Earth System Models, model components and tools by Kamal Puri (BoM, Australia) and Andreas Will (BTU-Cottbus, Germany) are presented in this document. The reviewers were asked to assess the level 1 service on ESMs, interact with at least one group having received level 2 services on one particular ESM and surf on the NEMO, CDO and OASIS web sites. Their full reviews can be found in Appendices 1 and 2. Their main remarks and suggestions are presented in section 2 and 3 above with our comments on what we did or plan to do to address them.

## 1. Introduction

### 1.1 Objectives

IS-ENES2 offers different services on climate models, components and tools. Andreas Will, leading the development of the regional climate model COSMO-CLM, and Kamal Puri, leading the Australian Community Climate and Earth-System Simulator (ACCESS) project, accepted to form the review committee and report on the services offered. This document presents their first review report. A second review report is planned at month 36 of the project, i.e. in a year.

### 1.2 Context

IS-ENES2 WP7/SA1 expands IS-ENES1 services offered on climate models, components and tools. More specifically, WP7/SA1 offers expert contacts to answer specific questions on models (level 1 service) for all 7 CMIP5 European Earth System Models. Going further, a higher-level service is offered for the MetOffice Hadley Centre and EC-Earth models in the form of direct help for running and configuring the models (level 2 service). Previous services on components (NEMO) and tools (coupler OASIS and post-processing tool CDO) are continued and upgraded with new releases and new products developed in the project.

The review assesses the visibility, accessibility, quality and usefulness of the services offered. The review is also expected to make suggestions for improvements. More specifically, it was suggested to the reviewers to:

- Assess the level 1 service on ESMs, i.e. verify that CIM metadata is available for all ESMs through the ENES portal and that the contact identified for the different ESM is reachable and replies to specific questions on the use of CMIP5 model output;
- Interact with at least one group having received level 2 services on one particular ESM and get their feedback on the quality of the help received;
- Surf on the NEMO, CDO and OASIS web sites and report on the information and help a user can get directly on these web sites (documentation, tutorial, FAQs, user forums) or via contacts identified on these sites providing additional user support

## 2. Review by Kamal Puri, from the BoM, Australia

Kamal Puri's report can be found in Appendix 1. The most significant remarks and suggestions are listed here; for each one, the text in italic describes what has been done or is still needed to address it:

- On the ENES portal (<https://verc.enes.org>) : the general impression is that the portal is comprehensive and provides relevant and useful information, although few links were either outdated or not working, for example the presentation by S. Jousaume (IS-ENES-130911-CAS2K13.pdf)

*A thorough check of all links is still needed.*

- On level 1 on ESM: all European models participating in CMIP5 are listed, and contacts are identified although the CMCC is not current. There is a need to conduct regular checks to verify that the contacts listed for the ESMs are current. The reviewer wrote to all contacts listed for Level 1 service seeking information that

could provide useful information for the review purpose; unfortunately, and disappointingly, not a single contact responded.

*This is very disappointing that no contact responded. All contacts were updated and confirmed to WP7/SA1 leader that they are ready to answer questions and that they will do so.*

- Although the ‘CIM views’ identifies the model versions, the reviewer (and another colleague) was not successful in obtaining any information on the model versions from the CIM portal, which pointed to the ES-DOC site.

*This technical problem with the CIM viewer was fixed; all CIM views are now available*

- Level 2 service on ESMs: The reviewer was not able to contact a group that has received the level 2 service as he did not know the identity of any group till a late stage in the review process. However the reviewer communicated with Amanda Lindsay, the contact person for the Met Office ESM and received very useful and valid comments.

*The reviewer will be asked to evaluate level 2 services for his second report.*

- It might be useful having information on IS-ENES services and updates go out to the IS-ENES community, perhaps some kind of monthly bulletin on key updates/events/deadlines. More engagement from potential research users who are on the fringes of the community would also be welcome. Suggestions are some kind of monthly bulletin on key updates/events/deadlines, a session at EGU or a similar meeting dedicated to showcasing the models with level 2 services and what they can offer to the weather and climate research community, and/or writing of an article about these ESMs in a reputable journal.

*These suggestions need to be considered during the next period.*

- NEMO web site: should be noted clearly that access needs registering. Apart from this, the site provides clear, useful and relevant information.

*The remark about the access needs to be addressed.*

- CDO web site: The site contains very useful information to potential users; overall this is a comprehensive and very useful site.
- OASIS web site: The site contains very useful information to potential users; overall this is a comprehensive and very useful site. This also reflects the views of users in Australia where OASIS is used extensively.

### **3. Review by Andreas Will, from BTU-Cottbus, Germany**

Andreas Will’s report can be found in Appendix 2. The most significant remarks and suggestions are listed here; for each one, the text in italic describes what has been done or is still needed to address it:

- NEMO web site: The information provided is regarded as exemplary or ‘perfect’; it is nearly up to date (June 2014) and no dead-link or wrong email was found.
- OASIS: The base information summarises the experience with the OASIS support in a very precise way. The personal support goes beyond what can be expected.

- CDO: The information provided is regarded to be precise. There is some room for clarification of the development aspect.
- On ESM level 1 services about the page structure: the structure of the ESM pages with two levels, one for the Earth System Modelling Groups and one for Earth System Models is confusing

*We think that the confusion comes from the fact that little information on the ESM group is provided at the “Earth System Modelling Group” level. Groups will be asked to add more information at that level.*

- On ESM level 1 services about the CIM metadata : The explanation of the acronyms and the links to the scientific documentation of the model system components is not regarded to be sufficient. Information is missing which allows to reproduce the CMIP5 simulation results : the configuration and the necessary input data describing the initial and boundary conditions are needed.

*These remarks were forwarded to the people developing the CIM in the CMIP6*

- On ESM level 1 services about the information provided on the ESMs : An overview of the model systems would be helpful exhibiting, which model system components are common and which are different. A second type of information was missing regarding the model development policy of the different consortia and opportunities for new model developments to be taken over in a next model release.

*This remark needs to be considered.*

- Maintenance of the contact people email addresses: The reviewer checked the correctness of the email addresses of the contact people. The result of the test was not satisfactory. Only 4 of 7 contacts given are correct. For these contacts, provision of user support was confirmed and the answers to the reviewers question fulfilled all expectations with clear and precise answers. The reviewer’s opinion is that such support should be provided within one week and the reviewers suggests to concentrate the contacts on one webpage to facilitate the maintenance. Some links have been found to be out-dated. The majority of the webpages have not been updated for one year, although the majority of the links to model descriptions have been found to be still correct.

*All these remarks need to be seriously addressed. As stated above, all contacts were updated and confirmed to WP7/SA1 leader that they are ready to answer questions and that they will do so.*

- Maintenance of the other links: The reviewer checked the correctness of the links. The result of the test was not satisfactory. Some links have been found to be out-dated. The majority of the webpages have not been updated for one year, although the majority of the links to model descriptions have been found to be still correct.

*All these remarks need to be seriously addressed.*

- Level 2 service quality: the review of this point could not be finalized in time.

*The reviewer will be asked to evaluate level 2 services for his second report.*

- The reviewer also checked the IS-ENES evaluation portal for climate models and the project aims.

*Even though these aspects are not part of the services on models and tools, we thank*

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*the reviewer for his comments and will consider them within other IS-ENES2 work packages.*

#### **4. Conclusions**

The reviews of IS-ENES2 services on Earth System Models, model components and tools by Kamal Puri (BoM, Australia) and Andreas Will (BTU-Cottbus, Germany) are presented in this document. Their full reviews can be found in Appendices 1 and 2. Their main remarks and suggestions are presented in section 2 and 3 above with our comments on what we did or plan to do to address them.

## 5. Appendix 1 – Review by Kamal Puri

### 1. Preliminary steps

As a means of gathering relevant information emails seeking information were sent to the following:

- Amanda Lindsay as the Met Office contact for the Level 2 service on HadGEM2.
- Contacts for Level 1 service providers namely, CMCC, CNRM-CM5, MPI-ESM, IPSL-CM5, NCC. I should note that (i) the CMCC contact needs to be updated as the automated message indicated a new address, (ii) NCC do not provide a contact name but refer to NCC Help Desk as the contact.
- Earth system modellers in Australia.

The information asked for included (i) views regarding the services offered through IS-ENES2, (ii) views on the visibility, accessibility, quality and usefulness of the services offered, and (iii) any comments/suggestions on ways the services could be improved.

Sophie Valcke, as the WP Lead also made available her report which provided useful information on the Work Packages and a summary from the Level 2 providers. Statistics on portal hits for the ESM pages were also provided. Although there appear to be some encouraging signs, more time is required before any firm information can be extracted from the statistics as they only started to be collected in August.

### 2. General impressions

Overall the IS-ENES2 portal is readily accessible although the access proved to be slow at times and the site was not reachable on one day despite a number of attempts. It is difficult to know whether this was due to issues at the portal server or at the receiving end. Apart from this negative feature the general impression is that the portal is comprehensive and provides relevant and useful information. It also provides ready access to various publications, presentations and documents although the presentation by S. Joussaume (IS-ENES-130911-CAS2K13.pdf) could not be downloaded and the accompanying message indicated that the file was damaged – this clearly needs to be remedied.

Independent response from a CAWCR colleague stated ‘It is a nice portal to a number of modelling systems – this is the sort of wrapping that was envisaged for the Australian CWSLab portal on our coupled model (ACCESS) but has been difficult to achieve because of resource limitations. It is definitely nice to have this sort of resource to guide people to things they need’.

### 3. Level 1 service on ESMs

- Supplied address in the invitation letter ([//verc.enes.org/models/earthsystem-models](http://verc.enes.org/models/earthsystem-models)) does not exist. However the user is directed to the correct (and accessible) site.
- CMIP5: Provides very useful information including CMIP5 contact (K. Taylor), CMIP5 timelines, and all participating models are identified although only a limited number of model descriptions are currently available.



- All European models participating in CMIP5 are listed, and contacts are identified although, as noted above, the CMCC is not current and the NCC contact points to the NCC Help Desk. Links are provided to the home pages of the modelling centres. Short descriptions of each ESM are provided as are links to component models.
- Includes links to major projects such as WGCM, IGBP, AIMES which should prove very useful for newcomers to the field.
- There is one clear problem. Although the ‘CIM views’ identifies the model versions, the reviewer (and another colleague) was not successful in obtaining any information on the model versions from the CIM portal which pointed to the ES-DOC site. None of the ‘Tools’ on this site could be listed – all attempts come up with ‘ES-DOC Ap1’ errors etc. As a result it is not clear to the reviewer what CIM metadata is available for each model. This is something that needs to be addressed urgently as it could result in potential users losing interest.

#### 4. Level 2 service on ESMs

The reviewer was not able to contact a group that has received the level 2 service as he did not know the identity of any group till a late stage in the review process. However the reviewer communicated with Amanda Lindsay, the contact person for the Met Office ESM and received the following very useful and valid comments:

- Services the Met Office has offered through IS-ENES2: We offered places on the annual week long training event for the Unified Model (UM), the UM User Tutorial, and on the annual conference discussing model development and evaluation, the UM User Workshop. We also offered access to the Model’s collaboration twiki which has a lot of information about the model, the history of the model, development of the model and model evaluation.  
Amanda has also been a dedicated user support point of contact for all UM related queries from the IS-ENES community.
- Visibility, accessibility, quality and usefulness of the services offered by the Met Office: We posted information on these services on the IS-ENES web portal, and it might be useful having information go out to the IS-ENES community when large updates are made to the web pages, or a list on the site of what’s recently been updated, or perhaps some kind of monthly bulletin on key updates/events/deadlines? If a higher level of interaction is desired with the European weather and climate research community then a more systematic understanding of their requirements would have to be made so as to understand the best way to engage them in using the UM.
- Ways services could be improved: We believe that knowledge of the UM and where to get further information on it is widespread in the European atmospheric modelling community. However we would like to get more engagement from potential research users who are on the fringes of the community at the moment. One suggestion is to have a session at EGU or a similar meeting which is dedicated to showcasing the UM and what it can do for the weather and climate research community, with demonstrations, case studies, presentations by UM partners, etc. Another possibility is to write an article about UM collaboration in a reputable journal.
- European groups that use the Met Office model: At the moment ICM, University of Warsaw in Poland use the UM. The Norwegian Meteorological Institute have used the UM operationally. The Finnish Meteorological institute get data from the Met Office seasonal modelling system. The UM is also run at ECMWF. We have a large numbers

of research users at many universities in the UK. The UM also has a large, enthusiastic and growing global community.

- Any inquiries through the IS-ENES portal: I had an email from the IS-ENES page concerning the UM User Workshop; I have had quite a lot of HadGEM2-ES enquiries this year from all over the world but largely from outside Europe, some of these inquires did not come directly to me so I assume they did not get contact information from the IS-ENES page. Of the emails that did come direct to me I do not know where they obtained my contact information. I have had one email addressed to both me and the CMIP5 helpdesk, and I believe the IS-ENES portal is the only place where my contact information and the CMIP5 helpdesk information are together. I do not know if the CMIP5 helpdesk have had HadGEM2-ES inquiries from the IS-ENES Community.

#### 5. NEMO web site

- The site indicated in the invitation letter [//verc.enes.org/models/is-enes-support-service/copy\\_of\\_nemo](http://verc.enes.org/models/is-enes-support-service/copy_of_nemo) does not exist. However the user is directed to the correct (and accessible) NEMO site.
- The site [http://www.nemoOcean.eu/Using\\_NEMO/Configuration](http://www.nemoOcean.eu/Using_NEMO/Configuration) could not be accessed. Although this is clearly noted in the NEMO home page and instructions on how to gain access are provided, this should also be noted clearly in the calling IS-ENES2 site. Otherwise the current situation could be a disincentive for potential users to proceed further. Similar access problems were encountered for the NEMO data base.
- Apart from the access problems noted above, the site provides clear, useful and relevant information such as references, comprehensive NEMO book with necessary details for potential users (User Guide) and a list of the projects using NEMO.

#### 6. CDO and OASIS websites

- CDO
  - Supplied address in the invitation letter (<https://verc.enes.org/models/software-tools/>) does not exist. However the user is directed to the correct (and accessible) 'Models and Tools' site.
  - The site contains very useful information to potential users including (i) the contact person, (ii) instructions on how to download/compile/install, (iii) known problems, and (iv) the CDO User's Guide.
  - Overall this is comprehensive and very useful site.
- OASIS
  - The site contains very useful information to potential users including (i) brief summary on the main page, (ii) the contact person, (iii) OASIS home page listed and readily accessible, (iv) access to a comprehensive User's Guide, (v) information on how to get started with OASIS-3, OASIS-MCT.
  - Overall this is a comprehensive and very useful site. This also reflects the views of users in Australia where OASIS is used extensively.

#### 7. Suggestions on possible improvements

- A number of links, including some in the invitation letter to me do not work. A major one concerns the CIM metadata site. Although the ‘CIM views’ identifies the model versions, the reviewer (and another colleague) was not successful in obtaining any information on the model versions from the CIM portal which pointed to the ES-DOC site. None of the ‘Tools’ could be listed – all attempts come up with ‘ES-DOC Api’ errors etc. As a result it is not clear to the reviewer what CIM metadata is available for each model. This is something that needs to be addressed urgently as it could result in potential users losing interest.
- There is a need to conduct regular checks to verify that the contacts listed for the ESMs are current. The CMCC contact, for example, needs to be updated as the automated message indicated a new address.
- The reviewer wrote to all contacts listed for Level 1 service seeking information that could provide useful information for the review purpose. Unfortunately, and disappointingly, not a single contact responded. This makes one wonder whether potential model users get a similar (non) response. It is not clear to this reviewer as to how to address this issue. However the IS-ENES2 management team needs to follow up on this as it is not a good look for the project.
- The reviewer has some concerns about the visibility of IS-ENES2 among potential European users. As noted by Amanda Lindsay, although knowledge of the UM and where to get further information on it is widespread in the European atmospheric modelling community, it would be desirable to get more engagement from potential research users who are on the fringes of the community at the moment. One possible way this could be addressed, and following Amanda’s suggestion, would be to have a session at EGU or a similar meeting which is dedicated to showcasing the IS-ENES2 project and what it can do for the weather and climate research community, with demonstrations, case studies, presentations by European modelling groups, etc. Another possibility is to write an article about IS-ENES2 in a reputable journal (e.g. BAMS).
- A regular IS-ENES newsletter providing general news of the projects, updates from the modelling centres, and IS-ENES2 events and deadlines needs to be given consideration as a possible way of improving communications.

## 6. Appendix 2 - Review by Andreas Will, BTU Cottbus, Germany

The review is based on the informations given on the web-pages <https://verc.enes.org/ISENES2> and on personal communication. The review is organized in two sections. First, the tasks described in IS-ENES2 ‘description of work’ are reviewed and second some objectives of IS-ENES are discussed in the context of the services offered. The suggestions for improvements can be found within the review points. An extension of this review with respect to the quality of the service offered will be provided later.

### WP7 tasks

#### 1. Services for NEMO, CDO and OASIS

- Accessibility of relevant informations:
  - a. NEMO: The informations provided are regarded as exemplary or ‘perfect’. They encompass informations about the NEMO-consortium and the base informations about the model system itself including current release versions, model history and scientific documentation available. Furthermore, installation informations, informations necessary to reproduce reference simulation results and last but not least, the model development process are given. The informations are nearly up to date (June 2014) and no dead-link or wrong email was found.
  - b. OASIS: The base informations collected on the IS-ENES webpage summarise the experience with the OASIS support in a very precise way. The personal support goes beyond what can be expected if reading about ‘help to efficiently use’ the software. In several cases substantial personal resources have been spent very efficiently to solve problems which occurred and reach new aims in coupled model systems.
  - c. CDO: The informations provided on the IS-ENES webpage are regarded to be precise. There is some room for clarification of the development aspect, which from the reviewers perspective is not completely clear from the CDO webpage as well. The meaning of ‘open development’ with respect to handling of contributions from different groups and with respect to missing features, known and upcoming problems has room for clarification.

#### 2. Services for the European Earth System models used in the CMIP5 experiments

- Accessibility of relevant informations: The informations are well structured and once the structure is understood for one model system, it is easy to get the same informations for another one. However, some aspects are confusing. First, the information about the position of the webpage given at the top is different from the menu in the left column. This, is confusing, leads to unnecessary surfing and should be improved in order to facilitate the navigation within the IS-ENES webpage. Second, the reviewer didn’t understand the need for one level of information. E.g. the information given on <https://verc.enes.org/models/earthsystem-models/mpi-m> is repeated on the next level <https://verc.enes.org/models/earthsystem-models/mpi-m/mpi-esm> and this level can be avoided.

- Meta-data gathered in the Common Information Model (CIM) for the ESMs used in CMIP 5 have been found to be complete on a basic level. The explanation of the acronyms and the links to the scientific documentation of the model system components is not regarded to be sufficient.
- Suggestion for extension of the information provided: An information was missing which allows to reproduce the CMIP5 simulation results. Additionally to the information about the versions of model system components, the configuration and the necessary input data describing the initial and boundary conditions have impact on the simulation results. Furthermore an overview of the model systems would be helpful exhibiting, which model system components are common and which are different. E.g. the CMCC-CESM is using ECHAM5 and LIM2, MPI-ESM uses ECHAM6, EC-EARTH is using LIM. A second type of information was missing regarding the model development policy of the different consortia. Many of the researchers interested in an ESM need to or intend to further develop a reference model version. An information was missing about opportunities to provide the model developments for being taken over in a next model release.
- Maintenance: The model systems are further developed, the people responsible are changing and the webpages are modified. Thus the quality of the informations has a limited live time. The reviewer checked the correctness of the links and email addresses and of the responsibilities stated. The majority of the webpages have not been updated for one year. The majority of the links to model descriptions have been found to be still correct. The following links have been found to be outdated:
  - a. Link to CMCC-CESM webpage <http://www.cmcc.it/data-models/models>
  - b. Links on HadGEM webpage, e.g. to twiki within the level 2 service information  
<http://http/collab.metoffice.gov.uk/twiki/bin/view/Support/UMUserWorkshop2015>
  - c. and to registration for the UM workshop  
<http://http/collab.metoffice.gov.uk/twiki/bin/view/Support/UMUserWorkshop2015> and to other pages on the HadGEM2 webpage
- Availability of support: The contacts to humans providing support for the ESMs have been found on each of the ESM webpages, not on the main IS-ENES service webpage <https://verc.enes.org/models/earthsystem-models>. Each of the contacts has been asked a certain question by email regarded to be a typical level 1 support question. The accessibility of the support (level 1 and 2) was
  - d. EC-EARTH: email arrived
  - e. CNRM-CM5: email arrived
  - f. IPSL-CM5 email arrived
  - g. NorESM: email arrived, out of office for 10 days,
  - h. CMCC-CESM: use another email, 2nd email arrived
  - i. HadGEM2: use another email, 2. Email arrived, out of office 14 days
  - j. MPI-ESM: not available

The result of the test was not satisfactory. Only 4 of 7 contacts given are correct. Two are not available for approximately 2 weeks, one contact was wrong without further informations. The correctness of this information is regarded as a key aspect of the service provided. The reviewers suggestion is to concentrate the contacts on one webpage in order to facilitate the maintenance and to update it more regularly. This should be done in the

table given on the main support webpage <https://verc.enes.org/models/earthsystem-models>.

- Level 1 service quality: The provision of user support was confirmed by all colleagues, who could be contacted. The answers to the reviewers question fulfilled all expectations. The supporters provided clear and precise answers including further hints in the case of deeper interest in the topic. The reviewers opinion is, if the user support is answering the questions, the answers have a high quality level. The key question remains the correctness of the contact address and the availability of the people within a minimum time span. The reviewers opinion is that if such a support is offered, it should be provided within one week. This was not the case at the moment for 3 of 7 services.
- Level 2 service quality: Unfortunately the review of this point could not be finalized in time. It requires a more intensive communication with the people involved at the institution, which got the support. The review for this point will be provided in April.

### Evaluation portal for climate models

In the following a first impression of the evaluation portal is given. A more deep review will be provided at a later time. This has two reasons. First, the reviewer did not test the tools offered yet. Second, the intended user group was not clear to the reviewer and his impression is that different tools offered require user groups having different skills in the field of climate modeling.

The evaluation portal facilitates the access to climate model evaluation results and is an attempt to introduce further standards in the field of ESM evaluation. However, the complexity of the data and tools offered ranges from common quantities like temperature and precipitation to calculation of radiances observed by satellites. Thus, the application of the tools and the interpretation of the results require expert knowledge. A stronger guidance of the heterogeneous group of potential users within the portal is recommended and a development of a help desk for different user groups is regarded as an important aspect in the future to enhance the usability of the tools offered.

The HOAPS tool offered is regarded as very useful. It enhances the usability of the observations significantly and the development of such a tool requires substantial personal resources.

A small review point is an out-dated link: <http://gcss-dime.giss.nasa.gov/mcms/mcms.html>.

### Project aims

1. Foster the integration of the European Climate and Earth system modeling community
  - Strengthen ENES governance, further developing its strategy, especially with regards to model evaluation and model developments

The reviewer agrees that model evaluation needs a central support and standard tools which make the results comparable. However, clear statements are necessary aiming to avoid misinterpretation of the model results. A list of recommendations is suggested.

- Stimulate interactions between global and regional climate modeling communities

Providing meta-data for regional climate model systems used for downscaling of CMIP5 experiments could stimulate the interaction between the global and regional communities. This should be done for all CORDEX-EU models and not only for those used by the project partners.

Enhance the development of Earth System Models for the understanding of climate variability and change

- Network on future model developments required to improve model quality and use of future computing architectures

Such a network is regarded as useful. An invitation of the experts within the modeling communities to topic-workshops might stimulate discussions of new developments.

Facilitate the application of Earth system model simulations to better predict and understand climate change impacts on society

- Enhance the dissemination of model results from both global and regional model experiments

The dissemination of model results is the main topic of climate service centers. This work should be well coordinated.

- Develop an interface dedicated to the climate impact community and improving the quality of information on simulations through metadata developments and guidance to users

The ‘interface’ to model output users needs an integrated personal support by modelers together with a list of recommendations how to deal with the model output, e.g. which spatial averages need to be computed before interpretation of the spatial differences. Etc. Such a list of recommendations should be available together with the interface.

- Enhance interaction between the climate modelling activity and users from companies and the emerging climate services

The complexity of climate and climate change informations accompanied by expert support can be the main difference between the data offered by IS-ENES and the climate service centers.