



SIXTH FRAMEWORK PROGRAMME

MESOR

Management and Exploitation of Solar Resource Knowledge

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D 3 Final Report on Connection to International Initiatives

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1 Objective of WP 3 “Connecting”

The block Connecting links the project to other relevant initiatives in the field of solar energy resource and geo-information. The objective of WP 3 was to establish such links and to disseminate the outcomes of the project and create multi-disciplinary synergy. It was expected to make other initiatives aware of the tackled challenges and adopted solutions (e. g., benchmarking, information system) and to put forward the specificities in solar energy to be taken into account in international standards or practices regarding geo-information and related information.

Four person-months were allocated to this task, led by Armines and whose other contributor was DLR. Though unplanned, CIEMAT and JRC contributed to this WP.

The activities were of the following types:

- exchange of mutual information on projects and challenges,
- participating to conferences, working groups and other meetings,
- active collaboration to projects by exploiting the knowledge of MESoR,
- incitement to contribute to the collaborative information system.

2 Major Results

The Consortium met the objective. Links were established with

- the European Commission INSPIRE (Infrastructure for Spatial Information in Europe). On the one hand, the project MESoR was capable to use the standards used by all geographical information providers before the INSPIRE initiative comes into effect. On the other hand, the project created awareness on specifics in solar energy, especially time system, expressed in the thesaurus;
- the International Energy Agency (IEA), and especially the Task 36 “Solar Resource Management” of the SHC (Solar Heating and Cooling) implementing agreement, and Task 2 of the PVPS (Photovoltaic Power Systems) implementing agreement and the SolarPACES (Solar Power and Chemical Energy Systems) implementing agreement. Exchanges were held regarding users needs for benchmarking and information system. There have been strong exchange with SHC 36 as MESoR and SHC 36 share the same objective and tools in benchmarking and the MESoR prototype will serve as a basis to the SHC 36 collaborative information system;
- the Global Earth Observation Systems of Systems (GEOSS). MESoR contributed to the 10-Year Implementation Plan and to users needs in the Energy Community of Practice, User Interface Committee. The MESoR prototype also served to the Architecture and Data Committee to demonstrate interoperability capabilities, in the framework of the AIP-2 pilot project;
- the European initiative on Global Monitoring for Environment and Security (GMES), organised by the European Commission, the European

Space Agency, with contributions by Earth observation agencies, such as Eumetsat, and meteorological bureaus, such as ECMWF, with special emphasis on the information system and interoperability;

- the United Nations: sharing views, concerns and solutions regarding users needs, the benchmarking, metadata and the collaborative information system with the Solar and Wind Energy Resource Assessment programme (SWERA) of UNEP, the World Meteorological Organisation (WMO), and the International Agency for Research on Cancer of the World Health Organisation (WHO). The latter is leading the European project Eurosun performing epidemiology studies to establish the role of solar radiation data on skin cancer;
- several non-EU meteorological offices and related agencies: weather bureaus of Australia, Canada and South Africa, the National Renewable Energy Laboratory (NREL) and Power programme of NASA in USA. Incitement to disseminate part of their knowledge through the MESoR prototype.

In addition, many other links were established at national level or with EC-funded programmes, e.g., PV-Performances, in the domains of solar energy, but also buildings, agriculture, bio-energy and environmental accounting of energy production by photovoltaics.

3 Detailed Activities

The following section details the activities and results.

There have been many connecting activities at national level by the partners, in the domains of solar energy, but also buildings, bio-energy, agriculture and environmental accounting of energy production by photovoltaics. They are not detailed here as it was not the main goal of the WP 3.

3.1 European Commission - INSPIRE

The project INSPIRE (Infrastructure for Spatial Information in Europe) of the European Commission aimed at developing tools and practices to establish an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment. This project results into the INSPIRE Directive entering in force in May 2007. The Commission Regulations implementing this Directive are regularly released as from December 2008.

Since the beginning, the consortium registered itself in the INSPIRE Community as a SDIC (Spatial Data Interest Community). The INSPIRE Work Programme in 2005 identified SDICs as self-organised communities bringing together the human expertise, technical competence, financial resources and policies of users, producers and transformers of spatial information organized by geographic region, societal sector or thematic issue. Legally Mandated Organisations (LMO) represent instead those organizations at local, regional, national, or international

level that have a formal legal mandate giving them the responsibility for specific thematic data resources. Together with the Group of Experts of the EC, SDICs and LMOs support the preparation of the Implementing Rules. Being a SDIC, the Consortium was aware of the progress of work and capable of contributing to the work, on metadata, discovery of services, access rights, interoperability of spatial data sets and services. It provides feedback on these tools, performances and benefits.

On the one hand, the project MESoR was capable to use the standards used by all geographical information providers before the INSPIRE initiative comes into effect. On the other hand, the project created awareness on specifics in solar energy, especially time system, expressed in the thesaurus, and presented its expertise in interoperability and Web services.

Specific technical work was made on the discovery of services. The Consortium used and commented the INSPIRE metadata editor, and raised awareness in the framework of its connecting activities with the GEOSS (see below). This tool was found useful by other international communities.

3.2 *International Energy Agency*

Links were established with the International Energy Agency (IEA), and especially the implementing agreements (Solar Heating and Cooling) and its task 36 “Solar resource knowledge management”, PVPS (Photovoltaic Power Systems) task 2 and SolarPACES (Solar Power and Chemical Energy Systems). Exchanges were held regarding users needs for benchmarking and information system.

In addition, the Task 2 of PVPS exploited satellite products provided by the Consortium for the benefit of experienced users in photovoltaics and provided feedback on the use of such products and the observed benefits. A IEA document was written.

There have been strong exchange with task 36 of SHC as MESoR and task 36 share the same objective and tools in benchmarking and the MESoR prototype will serve as a basis to the task 36 collaborative information system. In particular:

- sharing expertise in benchmarking;
- sharing expertise in quality control of irradiance data;
- establishing jointly a series of reference data sets for assessments of satellite products;
- sharing metadata and tools for the purpose of standardisation;
- sharing knowledge on Web services and collaborative information systems;
- sharing expertise and proof-of-concept demonstrators;
- increasing the base of institutes sharing this expertise in the world;
- providing tutorials on Web services and portlets.

3.3 Global Earth Observation Systems of Systems (GEOSS)

The GEOSS (Global Earth Observation Systems of Systems) will be a combination of existing and future systems of earth observation. It aims at the coordination of earth observations and the process was started at the 2002 World Summit on Sustainable Development in Johannesburg. GEO is the intergovernmental Group on Earth Observations which carries out the current 10-Year implementation plan of GEOSS. GMES (Global monitoring for Environment and Security) is a joint initiative by the European Commission and the European Space Agency. It aims at the design and establishment of a European capacity for the provision and use of operational earth observation services for environment and security. GMES is the European contribution to GEOSS.

The partners DLR, Armines and JRC are very active in the GEOSS and links were established to MESoR.

3.3.1 GEO Bureau

The Consortium was actively promoting the renewable energies at the highest level of GEO: Bureau and Ministerial meetings. MESoR contributed to the 10-Year Implementation Plan and the roadmap established in WP 1 will be a clear contribution to the future activities of the GEO.

Conversely, the GEO wants to highlight “climate services” in the coming World Climate Conference-3, 31 August – 3 September 2009, in order to illustrate the potentials of the GEOSS. The MESoR prototype will be demonstrated on the booth of the Bureau.

3.3.2 User Interface Committee – Energy Community of Practice

MESoR participants (DLR, Armines) are co-chairing the Renewable Energy Community of Practice approved by the GEOSS User Interface Committee. Thus, they ensure that all MESoR outcomes are included as an European contribution into the benefit area ‘Energy’ mentioned in the GEOSS 10-Year implementation plan. In addition, a member of Armines has been appointed as a co-chair of the User Interface Committee, thus ensuring that both the concerns of the solar energy community and the outcomes of MESoR are exposed at the highest possible level.

3.3.3 Architecture and Data Committee

The Consortium joined the working groups of the Architecture and Data Committee (ADC) in order to benefit from their expertise in metadata in geo-environment, and more specifically in the implementation schemas recommended by the OpenGIS Consortium (OGC). MESoR exposed its thesaurus and implementation schema as well. It was demonstrated that the OGC schemas were

not working properly with all software development environments and that further work is needed.

Part of the Consortium participated to the Architecture Implementation Phase 2 (AIP-2), September 2008 to May 2009. The AIP-2 intended to demonstrate the interoperability tools and called for thematic scenarios that would take the form of sustainable services integrating data from various origins. MESoR proposed a scenario on the siting of solar power plants, for which irradiance data but also many other data are needed, such as terrain elevation or hydrography for plant cooling. A Web service was designed and realised that is part of the MESoR prototype.

In participating, MESoR gained knowledge on interoperability beyond this specific Web service. MESoR contributed to the tools for connecting the worlds of the OGC and the World Wide Web Consortium, the latter being the one selected by MESoR to develop Web services. In AIP-2, MESoR learnt how to declare its Web services to the three GEOSS candidate-portals, and more generally to any OGC-compliant, or INSPIRE-compliant portal, since MESoR used the INSPIRE metadata editor to that purpose. In doing so, MESoR permits to the providers of the Web services to expose their services outside the MESoR prototype without doing further efforts.

3.4 *European initiative on Global Monitoring for Environment and Security (GMES)*

MESoR has been linked to the GMES initiative especially via the ESA GMES Service Element PROMOTE (dedicated to air quality, lead by DLR) providing atmospheric information necessary for solar resource assessment. The European Commission has launched the first phases of the implementation of the Global Atmosphere Service (GAS) by funding the project MACC (Monitoring Atmosphere Composition and Climate), beginning in June 2009. MESoR outcomes will help to define this service on atmosphere to ensure optimum data and service consistency and interoperability.

Discussions have been held, and are being held, between MESoR and the engineers in charge of the development of the portal ESA-SSE (Spatial Support Environment), a key element in the GMES activities of ESA. The focus is the mutual understanding of technologies in interoperability, mapping service and Web services, and eventually the adoption of common technologies and tools for mutual benefit.

Officials of Eumetsat, the European agency in charge of the operations of the meteorological satellites, were met. The importance of Earth observation data and the outcomes of MESoR were exposed.

Discussions were held with the European Centre for Medium-range Weather Forecast (ECMWF) about the possibility to include additional meteorological information: air temperature, wind speed, relative humidity, to the existing data sets on surface solar irradiance as requested by the users. It appears that such discussions having a commercial basis must be held with the national

representative. Consequently, discussions are on-going between Armines and Meteo-France.

3.5 *United Nations*

The Consortium linked to several initiatives of the United Nations:

- it shared views on metadata and information systems in the context of GEOSS with the appropriate working groups of the World Meteorological Organisation (WMO);
- it created awareness on the availability of surface solar irradiance and provided such data to the International Agency for Research on Cancer of the World Health Organisation (WHO). The latter is leading the European project Eurosun performing epidemiology studies to establish the role of solar radiation data on skin cancer. Conversely, the WHO established a series of user needs specific to its activities: radiation in UVA, UVB and erythemal, radiation reaching human bodies standing vertically, possibly in shadows;
- the UNEP (United Nations Environmental Program) has completed the first phases of its Solar and Wind Energy Resource Assessment programme (SWERA). The UNEP has consulted the Consortium to seek advices about collaborative information systems versus central archiving facilities and to explore synergies of a possible new UNEP programme and MESoR. Benchmarking and expressed users needs were elements of marked interest from the UNEP.

3.6 *Non-EU meteorological offices and related agencies*

The Consortium linked to several non-EU meteorological offices and related agencies for two reasons mostly: exchange of views on thesauri and metadata and information system, and incitement to disseminate part of their knowledge in the form of Web services, possibly through the MESoR prototype:

- the Australian Bureau of Meteorology: exchange on thesaurus and metadata, incitement to create a Web service for disseminating irradiance values observed in Australia. Discussion on this matter is on-going;
- Met-Canada: exchange on thesaurus and metadata, incitement to create a Web service for disseminating irradiance values observed in Canada, following the recently-made atlas of solar radiation. Discussion on this matter is on-going;
- the Dpt of Science and Technology, South Africa: incitement to create a Web service for disseminating irradiance values observed in South Africa, in close connection with the GEOSS in which South Africa is very active. Discussion on this matter is on-going;
- the National Renewable Energy Laboratory (NREL) of the USA: incitement to create a Web service for disseminating irradiance values observed in the USA, and other applications relating to conversion technologies. Discussion is on-going;
- the project POWER (Prediction of Worldwide Energy Resources) of NASA in USA which is sponsored by NASA's Applied Sciences Program

and is regarded as a contribution of the USA to GEOSS. Connecting MESoR to POWER has improved European access to USA data sources and scientific collaboration. POWER itself is interconnected to the World Climate Research Program (WCRP): exchange on benchmarking activities, mutual provision of reference data, incitement to create Web services to disseminate the sets of data presently disseminated by the portal NASA-SSE (Surface Solar Energy) in a non-standard format.