CLIMANDES

Climate services with an emphasis on the Andes to support decisions

Senamhi
SERVICIO NACIONAL DE METEOROLOGIA E HIDROLOGIA DEL PERU

2014

Peru is one of the 16 mega-diverse countries in the world, it has the second largest Amazon forest after Brazil, the most extensive Andean mountain range, 27 out of 32 climates of the world*, 71% of the tropical glaciers in the world and 84 out of 117 identified life zones on the planet *

*Source: Precision from the SENAMHI PERÚ
*Source: Ministerio del Ambiente/www.cambioclimatico.minam.gob.pe

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Amelia Díaz Pabló , Executive President of the National Meteorology and Hydrology Service of Peru (SENAMHI)

Climate change is now a reality which governments must take into account in their national planning, especially governments of those countries which are most at risk and most vulnerable. Peru is among the countries which are most vulnerable to climate change as it exhibits four of the five characteristics recognized by the United Nations Framework Convention on Climate Change: fragile mountain ecosystems, areas affected by flooding, drought and desertification, low-lying coastal areas, arid or semi-arid areas. It is most vulnerable also because these characteristics apply to a large portion of its territory and population (Second National Communication to the UNFCCC, 2010). For this reason, climate change is one of the greatest challenges that must be tackled in the coming years.

In recent years, significant investments have been made in Peru as part of government efforts to manage its socio-economic development. Given the vulnerability of the country, the necessity of taking measures that serve to maintain and stimulate these investments must be taken into account. Furthermore, the measures that are taken must be based on high-quality climate information and services and must be designed with the aim of adapting to and mitigating climate change, as well as of managing climate risks. Climate services are an important basis for reducing the impact of climate variability and change on society. Generating such climate services, which can save lives, assets and property as well as safeguard means of production and livelihoods, is a core commitment for the Peruvian National Service for Meteorology and Hydrology (SENAMHI). Information on how the climate will develop in the medium and long term must be timely, of high quality and easily accessible to those who need to assess the risks and opportunities of climate change, to allow them to take appropriate decisions for the long term. Climate services are therefore essential for government authorities and for users from

Gabriela Seiz , Head of International Affairs Division, Federal Office of Meteorology and Climatology MeteoSwiss

many economic sectors as basis for decision-making.

In order to generate reliable and timely climate information, it is vital firstly, to educate and train those who have to provide climate services according to international standards. Secondly, a dialogue with decision-makers must then be established so that they are able to understand and manage this information, which will ultimately support decision-making to the benefit of the population of Peru.

To meet the specific user needs, SENAMHI and the Federal Office of Meteorology and Climatology MeteoSwiss have designed and initiated the CLIMANDES project in collaboration with the World Meteorological Organization (WMO), the National Agrarian University La Molina (UNALM), the University of Bern, and Meteodat GmbH. CLIMANDES is funded by the Swiss Agency for Development and Cooperation (SDC). The bilateral collaboration formed between Peru and Switzerland for the purpose of this project is very innovative and forms part of the WMO-led Global Framework for Climate Services (GFCS). It promotes close collaboration between the National Meteorological Services of two countries (called “GFCS twinning”), enabling them to join forces in the generation of high-quality climate services.

Although Peru and Switzerland are thousands of kilometres apart, both countries face similar challenges in the weather and climate of their high-mountain regions. The CLIMANDES project has created an excellent platform for the sharing of knowledge and experience in addressing these common challenges. Peru and Switzerland have been collaborating successfully for more than 50 years. CLIMANDES both strengthens this long-term bilateral collaboration and will also provide local decision-makers in Peru with the information they need to better cope with the challenges of climate variability and change – for the benefit of its citizens.

Little boy with an eucalyptus branch in the highlands of the rural community of Tapu Yanahuanca in Cerro de Pasco.

CLIMANDES

(Servicios CLIMáticos con énfasis en los ANdes en Apoyo a las DEcisioneS)

Climate services with an emphasis on the Andes to support decisions

Numerous scientific studies have been compiled with the aim of understanding and determining the impact of climate change on human life. To support these scientific studies, a set of reliable climate and socio-economic data is required as basis.

The CLIMANDES project emerged in connection with the WMO-led Global Framework for Climate Services (GFCS). CLIMANDES seeks to improve climate services for the Peruvian Andes region in order to provide useful information for local authorities to support their decision-making, to the benefit of the local communities and society in general.

CLIMANDES therefore also seeks to provide continuous education and training to meteorologists, whose professional role is instrumental in creating climate-related products and services.

CLIMANDES, which depends on close collaboration between Peru and Switzerland, is coordinated by the World Meteorological Organization (WMO) and is run by the Peruvian National Service for Meteorology and Hydrology (SENAMHI) and the Federal Off ice of Meteorology and Climatology MeteoSwiss in collaboration with the National Agrarian University La Molina (UNALM), the University of Bern and Meteodat GmbH.

CLIMANDES is funded by the Swiss Agency for Development and Cooperation (SDC) and runs from August 2012 to September 2015.

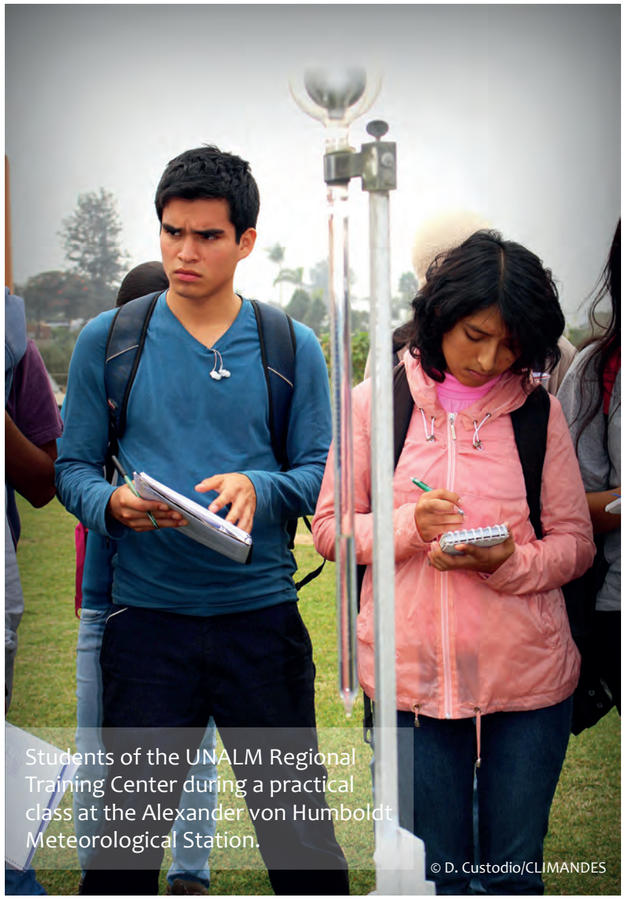
This brochure is informational material that highlights some noteworthy achievements in the areas of meteorological education and training, data management, and communication between users of the CLIMANDES project, which is in itself a milestone in the field of climate projects.

CLIMANDES RECOGNISES AND PROMOTES METEOROLOGY EDUCATION IN PERU AND THE COUNTRIES IN THE ANDEAN REGION

In Peru, the National Agrarian University La Molina (UNALM) is the only higher-education institution that trains meteorologists. In spite of its importance, however, this degree programme was discontinued for ten years due to the economic crisis affecting the country, which led to a shortage of meteorologists in the public and private institutions.

In 2007 an important step was taken to improve this situation when the Meteorology degree programme was re-opened at this university with the help of SENAMHI.

In May 2011, following the reopening, WMO, working in strategic partnership with SENAMHI, recognized the National Agrarian University La Molina as a Regional Training Centre (WMO RTC-UNALM). This measure granted the university responsibility for training and educating high-quality meteorological staff for the South American region, with special attention being given to students and professionals from the Andean countries.



Students of the UNALM Regional Training Center during a practical class at the Alexander von Humboldt Meteorological Station.

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In this context, CLIMANDES has collaborated with the WMO RTC-UNALM to arrange workshops with meteorologists from North, Central and South America. As a result, a new and modern Curriculum for the Meteorology Degree Programme has been designed which meets current training needs and standardizes the programme in the South American region.

The Curriculum devotes more classroom hours to the core sciences (Physics and Mathematics) and Instrumental Theory and also includes cour-

Professor Victoria Calle, Coordinator of the RTC and Mr. Mustafa Adıguzel member of the WMO Education and Training Department in the Virtual Laboratory implemented through CLIMANDES.

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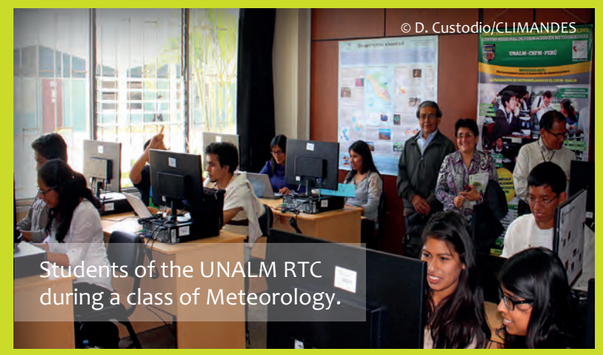

Students of the UNALM RTC during a class of Meteorology.

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ses on geographic information systems and meteorological communication. These latter courses were established in the light of a study examining the needs of institutions that recruit meteorologists, such as the Peruvian National Service for Meteorology and Hydrology (SENAMHI), the Peruvian Corporation of Airports and Commercial Aviation (CORPAC), the Department of Hydrography and Navigation of the Peruvian Navy (DHN), and the universities.

In order to enhance the development and vocational training of students in the region, CLIMANDES (in cooperation with WMO) is providing young people and professionals from the Andean countries with full grants for undergraduate studies at the WMO RTC-UNALM. To this end, CLIMANDES is issuing invitations to the training centre and internationally publicizing both the centre and the grants available at a variety of conferences, meetings and workshops where experts in the field of meteorology from the countries in the region come together.

CLIMANDES
Promotes the creation of a modern study plan for Meteorology

It takes into account:

- New meteorological demands from the global and regional market
- The need of institutions requiring professionals in Meteorology

Students of the UNALM RTC measuring the duration of the isolation with the heliograph at the Alexander von Humboldt Meteorological Station.

CLIMANDES SUPPORTS e-LEARNING FOR METEOROLOGICAL EDUCATION

In order to reduce the time, distance and cost barriers to studying the meteorological and climatological subjects specified in the project framework, CLIMANDES has been working since October 2013 to establish an e-learning platform that will allow those interested in Meteorology and Climatology to benefit from virtual training.

This tool enables students, technicians and professionals who are unable to receive face-to-face training for reasons of distance, work commitments, or a lack of funds, to study via remote access to this platform.

Three virtual courses on Climatology will be launched at the beginning of 2015. These courses have been created by the University of Bern in collaboration with the WMO Regional Training Centre at the Agrarian University La Molina (WMO RTC-UNALM).

Students of the UNALM RTC during a pilot e-learning class

Students of the UNALM RTC during a pilot e-learning class.

COMMUNICATORS AND THE PRESS: STRATEGIC ALLIES FOR CLIMATE SERVICES

Given the importance of the media as intermediaries between climate-service providers and the public that uses them, CLIMANDES considers it indispensable to educate communicators in the pilot regions of Cusco and Junín via participatory workshops.

At these workshops, communicators are briefed on meteorological, climatological and hydrological subjects and on suitable ways of communicating the technical aspects of climate information more effectively.

The workshops are also an important source of feedback since they take into account communicators' opinions and suggestions on how to convey information derived from climate products and services, such as warnings and forecasts. Thanks to this interaction, we are currently working to improve the dissemination of preventative communications and warnings in accordance with the actual needs of end users.

These workshops will also facilitate the compilation of a directory of radio, TV and print media providers in each pilot region and thereby identify and establish a network of communicators who are interested in and feel a commitment to climate services. Taken together, these outcomes will promote publicity about the products and services provided by SENAMHI.

Paolo Ambrosetti, specialist from MeteoSwiss and Chema Salcedo, journalist of RPP during an interview about the CLIMANDES Project.

Broadcasters and SENAMHI -Strategic allies in risk prevention.

Over 220 trained broadcasters within the framework of CLIMANDES.

IMPROVING COMMUNICATION FOR ACTION

Improving the quality of climate products and services in the short, medium and long terms to aid decision-making is part of what CLIMANDES seeks to do. CLIMANDES is therefore working to improve the presentation of forecasts and warnings.

CLIMANDES is also seeking to build closer ties with users in order to help them interpret forecasts and to solicit their requirements and opinions. In this way, it will ensure that meteorological information plays an effective part in decision-making that results in concrete and immediate measures for the benefit of the population.

A series of training workshops has therefore been carried out with professionals, meteorologists and forecasters from SENAMHI's headquarters and its thirteen decentralized regional offices. The workshops were aimed at the staff of other national bodies that generate meteorological products and services, such as the Peruvian Corporation of Commercial Aviation (CORPAC), the Department of Hydrography and Navigation of the Peruvian Navy (DHN), the Department of Aeronautical Meteorology of the Peruvian Air Force (DIRMA), the Geophysical Institute of Peru (IGP), the Lima Potable Water and Sewage Service (SEDAPAL), and the Ministry of the Environment (MINAM).

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At these workshops, representatives of SENAMHI's regional offices had the opportunity to demonstrate the measures undertaken in recent years to establish closer ties with local users involved in sectors such as agriculture, health and education. As a result, concrete and immediate measures have been taken, such as:

* The creation of standards for the protection of citizens. These standards were introduced in Arequipa thanks to information provided by SENAMHI on rates of ultraviolet radiation. As a result, hats were made an obligatory part of school uniform; the time at which the national flag is raised was changed (from lunch time to 9 am, the period when the incidence of ultraviolet solar rays is lowest); and school students were protected by the installation of a plastic mesh to form a roof in open recreation and leisure areas.

* Preventative measures, such as those taken in Cajamarca, where the municipalities initiated measures to clean riverbeds and drain various irrigation canals after receiving forecasts of heavy rainfall.


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* The prevention of respiratory diseases related to frost and cold spells in Cusco, Junín and Puno. Thanks to warnings of frost and cold spells issued by SENAMHI, the Ministry of Health prepared and supplied local health centres with every resource needed to counteract the effects of these adverse events.

As a further part of this outreach activity, CLIMANDES has scheduled consultation meetings with decision-makers in the pilot areas of Cusco and Junín in order to create the climate services which are suited to their needs.

These consultation meetings will in turn serve to reinforce communication between providers and users in order to make the flow of information more direct and efficient. The climate information and services will thus be conveyed to them in a more timely manner and thus promote better use of the climate services in the planning of medium and long-term activities.

These meetings will in turn serve to reinforce communication between both parties in order to make the flow of information more direct and efficient. The climate information and/or service provided will thus be conveyed to them in a more timely manner and may be used for planning their activities in the medium and long term.

Strengthening the capacities to improve the presentation of climate and meteorological services and products has allowed real achievements in favor of population

such as:

* Generation of guidelines for the protection of the citizens.
* Preventive campaigns for different sectors, such as health, education, agriculture, etc.

CLIMANDES does not only generate information but also promotes prevention campaigns against extreme events.

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CLIMANDES IDENTIFIES THE NEED FOR CLIMATE SERVICES TAILORED FOR THE ANDES

Since the users of climate services are diverse, it is necessary to conduct studies to properly identify them and to understand their needs. To this end, CLIMANDES has conducted a demand study and identified climate-service requirements in the pilot regions of Cusco and Junín.

The study was aimed at obtaining information on the users of climate services, their information needs, the frequency with which they use existing services and their satisfaction with the existing services, in order to refine the climate services provided by SENAMHI.

The study enabled two main stakeholders to be identified: decision-makers (authorities) and farmers. The former are interested in information for prevention and planning purposes while the latter are interested in information for planning, managing agricultural production and reducing the impact of extreme events on their production.

In both pilot regions, the climate services to be provided must emphasize three main issues: frost, heavy rain and hail storms. These have been identified as the meteorological hazards that have the most significant impact on local socio-economic activities.

According to the study, public and private decision-makers require climate services to be reliable and accessible.

In conclusion, the study identified that the most effective means of communication for reaching public users would be townhall meetings, loudspeakers, rural radio stations, email and mobile phones.

Frosts, heavy rains and hail storms have been identified as the meteorological hazards that have the most significant impact on local socio-economic activities.

CLIMANDES identifies the needs for climate services in the Junin Region.

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CLIMANDES identifies the needs for climate services in the Cusco Region.

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HIGH-LEVEL TRAINING IN METEOROLOGY AND CLIMATOLOGY

In order to achieve continuous improvement in the availability of high-quality and reliable climate forecasts, it is crucial to strengthen the skills of forecasters and specialists in Meteorology. CLIMANDES has so far held ten training events, which were attended by over 250 national and international participants, providing a total of over 360 hours of training.

The most notable of the training events organized were:

* A regional seminar for Meteorology teachers from the regions of North, Central and South America.
* A workshop on 'Nowcasting in Andean areas'.
* A course on 'Assessing the socio-economic benefits of hydrometeorological information'
* Course: "Agrometeorology in Andean areas"
* A course on 'Mesoscale meteorology'
* A course on 'Introduction to ensemble forecasting'.

Those who participated in these training events highlighted the importance of CLIMANDES and the contribution that it made in providing continuous education and refresher courses to meteorologists in Peru and the Andean countries. The work carried out by CLIMANDES is also crucial to the professional development that will result in more accurate and timely climate products for numerous economic sectors.

More than 250 trained professionals

More than 360 teaching hours

International and national participants

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Training courses within the framework of CLIMANDES integrate meteorologists from the South American Region.

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THE IMPORTANCE OF HIGH QUALITY DATA FOR CLIMATE SERVICES

Meteorological data are obtained from a range of instruments that measure various atmospheric variables such as precipitation, temperature and humidity. These instruments are either conventional (involving a person from the locality, known as “an observer”, manually taking the measurements using the equipment and instruments installed at the station) or automatic (where the sensors automatically record the data and send them via satellite to SENAMHI’s database). The stations in Peru have been using conventional instruments for many years and are still using them in many cases today.

In view of the fact that climate analysis uses meteorological information taken over extended time periods (10, 20, 30 years or more) and that conventional and automatic observations can contain various measurement errors, the data must be validated before use by means of a quality-control procedure. Therefore, SENAMHI has introduced a series of measures to improve its data quality control procedures.

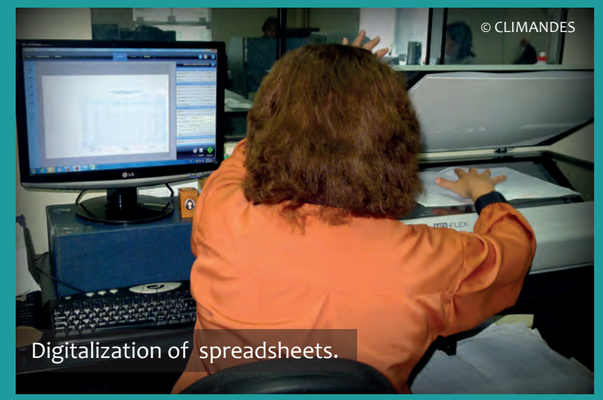
To this end, a process was initiated to digitalize documents containing historical data. These documents, referred to as “climate sheets”, relate to meteorological stations that have recorded data over periods of between 30 and 50 years. Owing to the passage of time, the environmental conditions and the handling of the archives, the documents are in a state of constant deterioration.

The process of digitalizing the historical documents will also allow the data to be accessed more easily and quickly by electronic means. This will allow faster and more thorough quality control and analysis to be carried out on the data. Ultimately, it will help in the creation and improvement of climate products and services.

Specialized software known as HOMER (HOMogenization softwarE in R) has also been implemented in the new quality-control process. HOMER was developed as a result of a European Project called HOME (Mestre, 2013) and is designed to homogenize climate variables on a monthly and annual basis.

This improvement in data quality control was made possible thanks to the progressive transfer of knowledge between MeteoSwiss and SENAMHI in various knowledge-sharing sessions and internships, in which Peruvian professionals visited MeteoSwiss and vice-versa, and in a workshop on homogenization. All of these activities were promoted by CLIMANDES.

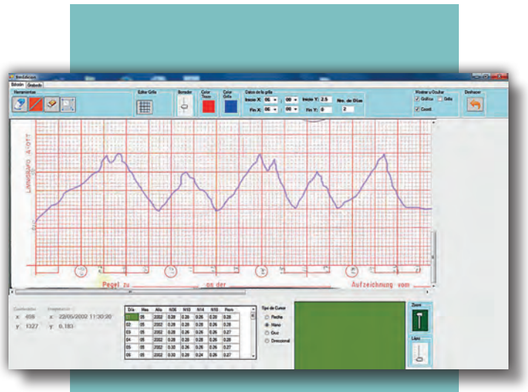
Climatological spreadsheets with information of more than 50 years.



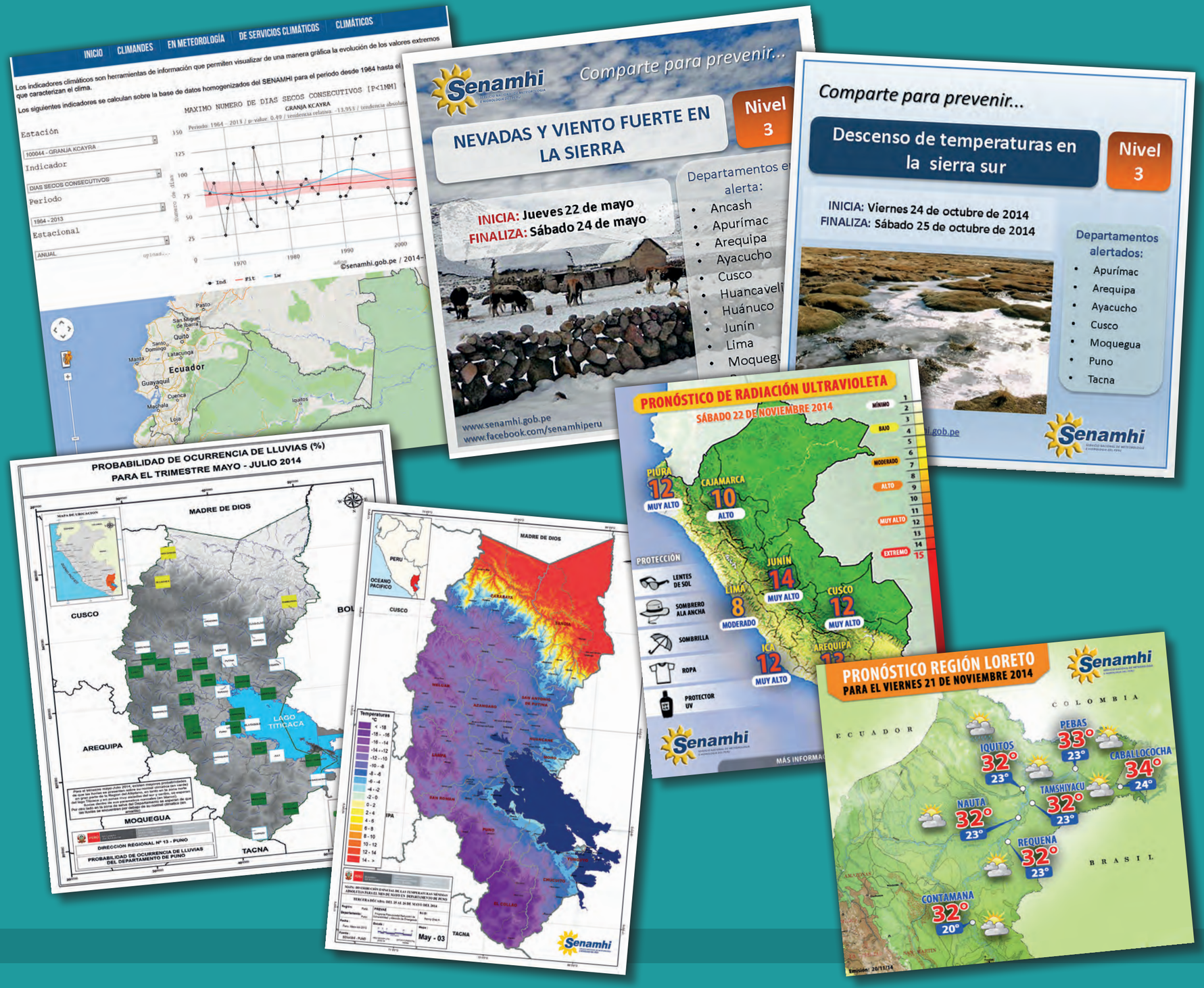
Digitalization of spreadsheets.

Server containing climatological digitalized data.

In the medium term, the improvement in the applied data quality-control procedures will foster the development of better climate services for various user sectors in the two pilot regions. Furthermore, in a similar manner, the climate products and services will support local decision-making, to the benefit of the local population as well as society at large.



Software that allows digitalization of climatological data.



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Swiss Agency for Development and Cooperation SDC

WMO OMM

LIMA COP20 | CMP10
UN CLIMATE CHANGE CONFERENCE 2014

Hecho el Depósito Legal en la Biblioteca Nacional del Perú N° 2014-18557
Editado por: SENAMHI
Impreso por: Digital Print Service E.I.R.L - Av. Salaverry 1298, Lima 11.
Diciembre 2014.

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