ANDES-BASED CLIMATE SERVICES FOR DECISION MAKERS (ClimAndes)

EXTERNAL EVALUATION REPORT OF ClimAndes PHASE 1

Contract number: 81031720

Project number: 7F-08453.01.02

Country of assignment: Peru

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External Consulters

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PROFILE OF CLIMADES: BASIC INFORMATION

Country:	Peru	Project Name:
SDC No SAP:	7F-08453.01	**Andes-based climate services for decision-makers (ClimAndes) Phase 1**

Impacts	The country has sufficient capacity to provide quality climate products and services for taking decisions for the public
Expected outcomes	Expected outcome 1: A Regional Training Centre (RTC) to prepare staff specialized in meteorology and climatology (Module 1) Expected outcome 2: Public bodies using climate information properly for decision-making as part of the Global Framework for Climate Services (Module 2)

Duration of the project	15.08.2012 – 31.07.2015
Reporting period	01.08.2013 – 28.02.2014
Overall budget (CHF)	3 175 000

Organisations involved:	
Participants:	World Meteorological Organization (WMO) National Meteorology and Hydrology Service of Peru (SENAMHI) Federal Office of Meteorology and Climatology of Switzerland (MeteoSwiss) Universidad Nacional Agraria La Molina (UNALM) Environment Ministry of Peru (MINAM) University of Berne (UniBe) Meteodat GmbH (Meteodat)

Executive Summary

Under the assignment for an External Evaluation (Contract number: 81031720; Project number: 7F-08453.01.02) of the ClimAndes Phase 1, an assessment on the strengths and weakness, challenges and opportunities of ClimAndes on its first phase has been successfully carried out by reviewing the ClimAndes-derived documentation and by means of face-to-face interviews and remote enquiries with the project beneficiaries.

We highlight, first, an overall good impression of the impact and benefits achieved by the implementation of the ClimAndes Phase 1.This applies to both main objectives and related outcomes, since the evaluators consider that the project is effectively and efficiently paving the way to enhance both long-term availability of well-trained professionals and the institutional capabilities to elaborate, communicate and delivery the climate products and services required by the Peruvian and Andean countries. In this regard, the evaluators think it is worth to continue supporting ClimAndes on its second phase to make possible the consolidation and institutionalisation of the scientific, technical and technological knowledge achieved in the first phase of the project.

Main achievements and impact of Climandes Phase 1 can be summarised as follows:

- Strengthening of the RTC: a reinforced formal and, particularly, informal educational and training capacity through supporting the World Meteorological Organisation Regional Training Centre (RTC) for the Western countries of South America;
- Improved institutional capacity at SENAMHI: an enhanced knowledge and expertise among SENAMHI personnel to produce reliable, opportune and timely delivered climate products and services, know-how and tools that are being operationally implemented, resulting in an improved institutional capacity at SENAMHI; and
- Progress in climate services value perception: an improved knowledge of decision-makers and end-users needs and their requirements for climate products and services, particularly over the two pilot areas of Cusco and Junin.

In addition, the evaluators have also identified a number of deficiencies and weaknesses that should be addressed and corrected in the second phase of ClimAndes, if finally supported.

One shortcoming identified has been a poor project coordination and management, including an inefficient Monitoring Committee structure that involves all the participant organisations in

following up activities. The dilated time taken in the prolix processes to evaluate/approve the outcomes and readdress issues has been a factor in delaying some of the activities scheduled, which along with an inefficient project management from the two main Peruvian and Swiss beneficiaries has been another factor limiting to successfully accomplish some of the specific objectives of the project.

The lack of qualitative vision and good management practices to ensure the impact and sustainability of ClimAndes beyond the end of the international financial support is also another related deficiency. This poor project management can partially explain, along with rigid Peruvian regulations, some of the shortcomings identified in both expected main outcomes, namely:

- The weaknesses and threats that the RTC faces related to staffing issues and insufficient, by now, institutional support from UNALM authorities
- The still insufficient infrastructural and technological resources at SENAMHI and the need of consolidating the know-how learnt at the specialised training to timely provide climate services
- And the deficient planning of the mechanisms to communicate and involve policy-makers and decision makers to support the provision and dissemination of climate services over Peru through fostering the relevant networking.

In addition, and as stressed in the ClimAndes-2 Monitoring Committee Meeting held as a side event at the WMO Congress on its seventeenth session (Geneva, 28/05/2015), the initial limited global impact of ClimAndes mentioned in this evaluation report as one of the weaknesses identified has been timely addressed by the WMO partner and an increased visibility has been enabled thanks to a prominent dissemination of the scope and results of ClimAndes through WMO communities and its website main page. This points to the readiness of the ClimAndes partners to address and correct its weaknesses, once identified.

1. Introduction

On the 23rd and 24th of February 2015 a Mandate Type B was signed between the Swiss Confederation, represented by the Federal Department of Foreign Affairs, acting through the Swiss Agency for Development and Cooperation (SDC: Bern, Switzerland) and Fundació URV (Univeristy Rovira i Virgili Foundation: Tarragona, Spain) for the External Evaluation of the Project ClimAndes Phase 1 (Contract number: 81031720; Project number: 7F-08453.01.02). The objective of the contract is to undertake an External Evaluation of the Project ClimAndes Phase 1 in accordance with the Terms of Reference (ToR) shown in Annex 1 to this evaluation report.

The assignment is intended to provide to the contractor and participating organisations an independent evaluation of the relevance, effectiveness/efficiency, impact and sustainability of the project on its Phase 1, formulate and justify recommendations for improving efficiency and impact of ClimAndes on its Phase 2 and elaborate and deliver communication material, based on the findings and lessons learnt under ClimAndes Phase 1 (hereafter P1).

The purpose of this external evaluation is, then, to assess strengths, weaknesses, threats to sustainability and opportunities of the project for its two major objectives; namely,

1) to reinforce the World Meteorological Organisation (WMO)/Regional Training Centre (RTC) at the UNALM as a reference in the Andean Region to train and prepare staff specialised in Meteorology and Climatology, and

2) to ensure an adequate use of the climatic information by Peruvian decision makers and end-users as envisaged by the Global Framework for Climate Services (GFCS). This implies to address all the GFCS main components (from climate products and services provision through capacity development activities to engage relevant policy-makers and end-users in a regular dialogue to enhance the usability of the climate products and services delivered) as integral parts of ClimAndes.

In this regard, this external evaluation has analysed the ClimAndes-derived documentation and met with the different partners to get their insights on the strengths, weakness, successes and challenges faced by the committed activities under the SDC Project Document (SDC ProDoc), both for the Swiss and Peruvian-based organisations. The role and achievements of the involved organisations have been examined following the methodological approach agrees under the ToR of this consultancy:

1) Request, compilation and review of ClimAndes P1 documentation provided by SDC, MeteoSwiss, WMO, UniBe, Meteodat and SENAMHI as a home-based activity to get insights on the progress made, the shortcomings identified in the deployment of the project on its P1 and the issues to be evaluated in the assignment by identifying relevant questions to be made to the beneficiaries and stakeholders;
2) In-situ interviews (either in Switzerland and Peru) with the most prominent and accessible stakeholders of the project to get their views on ClimAndes P1's achievements and weakness to readdress them on its P2. These interviews were conducted at:

   - the World Meteorological Organisation (WMO)/Project Coordination Unit Office for Resource Mobilization and Partnerships, WMO/ Regional Office for the Americas, Development and Regional Activities Department and WMO/ Education and Training Office at the Geneva WMO headquarters on April, the 7th, 2015;
   - the SDC at its headquarters in Bern and Lima on April, 9th and the 13th, 2015, respectively;

- the Swiss Federal Office of Meteorology and Climatology (MeteoSwiss) in Zurich (April, the 8th, 2015), along with the other two MeteoSwiss sub-contracted organisations; namely, University of Berne (UniBe) – meeting conducted at the European Geosciences Union Annual Assembly in Vienna, April, the 14th, 2015 – and Meteodat GmbH (Meteodat), face-to-face meeting on March, the 18th and 19th, 2015, and teleconference on April the 8th, 2015;
- the National Meteorology and Hydrology Service of Peru (SENAMHI) in Lima on the 10th and from the 14th to the 16th, April, 2015; and
- the Universidad Nacional Agraria La Molina (UNALM) at its Campus in Lima on the 16th April, 2015.

3) Follow-up by email and develop the final products committed under the ToR of this consultancy (home-based activities)

All these activities have been timely defined – despite the time constraints posed by the short development time of this consultancy – and carried out to examine the relevance and feasibility of the objectives and the integrity and value of the outcomes envisaged in the SDC ProDoc, the degree of achievement of the objectives and activities scheduled in P1 and the impact and benefits derived of the implementation of the project.

This external evaluation report is organised as follows: the main findings and overall results emerging from the external evaluation assignment are described and justified in the next section 2, while section 3 is devoted to provide a detailed analysis on the relevance, effectiveness, efficiency, impact and sustainability of the specific objectives and activities carried out to support the project end-goals, in order to evaluate the degree of accomplishment of both main objectives and expected outcomes, in two separated sub-sections. Finally, the general conclusions of the external evaluation are provided in the last section.

2. Overall results and main findings of ClimAndes Phase 1

The external evaluators, along with representatives from the interviewed participant organisations, share the general view that ClimAndes is a worthy supporting project that should be continued on its second phase (P2) to make possible to attain its end goals: ensuring an enhanced scientific and technological capacity to produce and timely delivery reliable, useful and accessible climate products and services to supporting decision-making in Peru. This

will be achieved through setting up a Regional Training Centre (RTC) that guarantees sustainable formal education in Meteorology and Climatology to the enrolled undergraduate students and informal training and capacity development activities on specialised and applied meteorological and climatological topics to ensure long-term availability of well-trained professionals. This objective, along with guaranteeing the necessary infrastructural, scientific, technical and technological capabilities at SENAMHI, will ensure the elaboration of robust climate products and services to better respond to the impacts that climate variability and climate change pose on the vulnerable socio-ecosystems of the Peruvian and Andean countries and better adapt these countries to present and future climate change impacts.

The evaluators' impression is that ClimAndes end-goals and its expected outcomes are still very relevant and will continue being so beyond the lifetime of the project. This relevance is closely tight to the need to respond to the requests of the GFCS in an especially sensitive environment to meteorological and climatological extremes, which may be exacerbated by anthropogenic climate change. Peru and other Andean countries socio-ecosystems are particularly sensitive and vulnerable to a variety of physical, chemical and biological degradation processes and to the impacts of interannual (and longer timescales) modes of climate variability (e.g. ENSO impacts). Anthropogenic climate change may add to and exacerbate the existing problems of glacier retreat, soil and land degradation, loss of biodiversity or water scarcity. Such changes pose major threats to water supplies, affecting agricultural, livestock and dairy productivity and hydropower generation, human health and placing at risk food production, having the potential to disrupt the national economies of countries across the region.

The evaluators consider ClimAndes a project of high national, regional and international relevance. The relevance and novelty of the ClimAndes formula relies on the integration of all the main GFCS components and major pillars into the project design. The cross-cutting component of capacity development and the user interface dialogue are at the centre of the project, stressing even more its coupling with GFCS' objectives. ClimAndes seeks to enhance the quality and use of climate and meteorological observations over Peru and the technical and technological capabilities to better support the elaboration of climate monitoring, forecasting and prediction products. These products contribute to the foundation of climate services, tailored after interactions with end-users and decision makers, articulated as well through ClimAndes. The enhancement of capabilities for climate data management and climate weather analysis is linked to the implementation of an on-line friendly accessible visualisation portal as part of its dissemination programme.

All present and future climatic threats require reducing exposure and vulnerability of the affected socio-ecosystems and to be prepared to respond and recover from the negative impacts related to climate variability and climate change affections. Therefore, the need for providing robust, useful and timely climate products and services to support decision making is still an end-goal highly relevant, *and the two main expected outcomes from ClimAndes are effectively and efficiently paving the way to enhance both the availability of enough and well-trained professionals and technicians and the institutional capabilities to elaborate, communicate and deliver the climate products and services that the society of Peru and other Andean countries require*.

The evaluators have an overall good impression of the reasonable impact and benefits already achieved under ClimAndes P1 in both main objectives and related outcomes and think that both thematic parts have been developed with high efficiency, taking into account the financial resources provided by the Swiss donor and the outstanding results attained in its P1, for which the project deserves further support. However, the implementation of a very ambitious and two-pronged project has faced a number of constraints that have been identified as deficiencies and weaknesses that must be addressed under ClimAndel P2, if supported. Despite of these execution issues, many indicators point to a reasonably successful project on its first phase and make recommendable its continuation in a second phase, as envisaged.

The general opinion about good adequacy, relevance, effectiveness, efficiency, impact and sustainability of the project in the deployment of P1 is based on the substantial steps taken to pave the way to ensure in the long run that Peru has the scientific, technical and technological capabilities to elaborate and delivery climate products, and services of enough quality, to support timely decision making by involving the relevant actors, as it will be documented in detail in section 2. The evaluators think that a reasonable success has been achieved, accomplishing most of the committed activities in both main outcomes, either by the relevant contributions made for the reinforcement of the WMO/RTC to attract and prepare the enrolled students and staff in meteorology and climatology with the mission of becoming a reference centre in education, training and capacity development of climate products and services production for the Western South American countries or by the – ClimAndes-enabled – enhanced infrastructural, scientific, technical and technological capabilities in Peru to produce and deliver reliable, useful and timely climate products and services and communicate them to stakeholders.

Among other major achievements from ClimAndes P1, these key outcomes should be highlighted:

- A strengthened capability to educate, train and capacitate students and staff in Meteorology and Climatology studies through reinforcing the RTC for the Andean region that will ensure in the mid and long term an enhanced national and regional availability of professionals and technicians enabled to elaborate high-quality and timely climate products and services
- An increased knowledge, expertise and know-how among the SENAMHI personnel and other relevant Peruvian organisations, including staff from neighbouring National Meteorological and Hydrological Services (NMHS) in the Andean region and beyond, in specialised meteorological and climatological topics and in the-state-of-the-art methods and techniques that constitute the basic knowledge and tools required to elaborate climate products and services, thanks to the relevant capacity building activities implemented
- An enhanced institutional capacity at SENAMHI, both scientific, technical and technological, although not enough, yet, to produce and deliver climate products and services, which is related to the improvement and integration in an operational basis of the new knowledge and tools acquired by its personnel during the specialised training to generate high-quality climate data and the elaboration of climate monitoring, prediction and forecasting products and services
- A set of two well-defined e-learning modules to remotely train interested people in climatological topics that are the basic and initial knowledge to acquire before ensuring a regionally-wide capacity to produce and delivery climate products and services
- A mentionable impact of ClimAndes among the neighbouring countries gained thanks to the capacitation activities organised under P1, which have trained staff from the Andean NMHS and beyond and have enabled the signature of bilateral cooperation agreements to promote know-how for improving climate monitoring systems, the generation of high-quality climate time-series to support the elaboration of scientifically sound climate products and services and ensure the sustainability and scope of future capacity development activities
- An increased visibility of SENAMHI as reliable provider of climate products and services among relevant Peruvian governmental bodies, such as the Ministries of Environment, Agriculture, Housing, Transport and Communications, Prime Minister's Office, Water National Authority and regional governments, among others

- A better knowledge of decision makers and end user needs and requirements for climate products and services production and provision over the two pilot areas of Cusco and Junin (mostly transferable to other Andean countries) and an improved climate data quality and availability to support the provision of climate services over these pilot and other Peruvian areas
- An enhanced institutional capacity to ensure sustainable data recovery and development of high-quality climate time-series thanks to the integration of the new procedures learnt into the climate data management system currently under implementation at SENAMHI
- An improved know-how in key and basic climate monitoring and prediction techniques that are unavoidable steps to ensure the production of robust and quality proven climate products and services
- An envisaged strategy to communicate and involve stakeholders and end-users in the usage and relevance of the climatic information applied to their specific needs and an improved capacity to publicly disseminate the relevant climatic information among the end-users
- The implementation of an initial climate indicators visualisation portal to make possible a friendly and accessible dissemination of climate monitoring products
- An enhanced flexibility of the main Peruvian beneficiary (SENAMHI) and WMO partner to address shortcomings identified during the internal evaluations of the project and to apply the required corrections by introducing new activities not envisaged in the SDC ProDoc.

Broadly speaking, the evaluators consider that ClimAndes P1 has been reasonably successful to pave the way for future production and delivery of climate products and services in Peru and beyond thanks to the enhanced training capacities and know-how gained under its P1 and the institutionalisation of the new capacities acquired by the trained staff in an operational mode. The evaluators got also good impression of the efforts placed by all the beneficiaries to timely accomplish with the activities envisaged for the two main outcomes, despite of the constraints for the Peruvian beneficiaries that the rigid political-administrative system in force in Peru determines. In this regard, it's especially remarkable the achievements attained by SENAMHI, even though its complex and externally-dependant administrative system, since this organisation has shown its readiness to implement and add new and necessary specific objectives and activities that were not envisaged in the project agreement to solve some of the deficiencies identified when deploying the project (e.g. two new specific objectives: the implementation of data and metadata rescue activities at SENAMHI to ensure availability of

high-quality and long-term historical observations over the whole country or the contract of a communicator to correct the identified communication deficiencies).

Despite of the remarkable achievements mentioned, the implementation of the ClimAndes P1 has not been exempt of deficiencies and shortcomings, most of them related to rigid and bureaucratic Peruvian regulations that face on a day-by-say basis the two main beneficiaries in Peru: SENAMHI and UNALM and to inefficient project management practices, as already mentioned.

A first setback to the development of ClimAndes on its P1 has been the lack of good coordination and management practices to ensure its smooth implementation and fluid exchange of information and results among the project's partners and the society, such as highlighted and justified next:

- Inefficient project coordination and management practices, including poor indicators and metrics to measure progress, particularly for Outcome 1 with regard to the RTC activities
- Lack of a long-term vision on the roles of the RTC and SENAMHI as reference educational and training regional centre and as provider of opportune climate services, respectively
- Legal constraints at UNALM to modernise and adapt its formal academic programs (e.g. the Meteorology Degree), including climatological topics and competencies, and to promote post-graduate studies, along with staffing problems at UNALM
- Still limited know-how and insufficient infrastructural and technological resources to support the production of robust and timely delivered climate services at SENAMHI
- Deficient planning to engage policy makers and poor communication and networking strategies to support climate services in Peru

The structure adopted for coordination and to ensure a fluid exchange of results and challenges found is the Monitoring Committee that involves all the beneficiaries and the donor and intends to meet periodically to assess the project progress every six months. This structure has been somewhat inefficient due to the dilated time that takes the process of internal approval of the intermediate evaluation reports. This can be explained due to many other commitments that every participant organisation has in addition to ClimAndes work, being, at least a factor, if not the cause, of some of the delays experienced in the project. This deficiency must be addressed in ClimAndes P2 by designing a more efficient and flexible process for the internal evaluation of the progress made and to address the project shortcomings identified by the Monitoring Committee.

A lack of long-term qualitative vision of the project management structure to further impel the outcomes by using and optimising other existing internal and external opportunities and establish synergies with other related bodies and projects to make the ClimAndes outcomes' sustainable into the future is another setback. This poor vision is common in both main beneficiaries (SENAMHI and MeteoSwiss) project management. In the case of the Peruvian partner, the poor management practices are related to a lack of institutional expertise in projects management that can be mainly explained by the inexperience of the Peruvian project manager to efficiently coordinate, articulate and provide the qualitative vision required to carry out efficient and effective, sustainable, high-impact and interrelated project activities. Whilst in the case of the Swiss' partner, it has suffered the lack of interaction with the WMO partner to better support, and respond, to the project challenges and enabling that ClimAndes is regarded by GFCS communities and worldwide as a good example to follow by others. This has been especially problematic in the area of communication and dissemination of the relevance and opportunity of the project in the framework of GFCS. Neither the novelty of an integrated project nor the promising results from ClimAndes have hardly been used and communicated as a case study on the benefits and challenges that the implementation of a complete climate services facility that takes into account all the GFCS components can bring to other regions amid the GFCS communities. Therefore, the WMO role to ensure synergies with other projects in the region, along with the dissemination and export of ClimAndes results to NMHS worldwide has not been fulfilled, pointing to the need for either a better project management by the main beneficiaries for ClimAndes P2 or a more active WMO, especially to what concerns to its Regional Office for the Americas role for seeking and organising common working spaces with SDC and the beneficiaries to better support and promote ClimAndes. However, and as stated in the introduction, recently WMO is paving the way for a more efficient dissemination of ClimAndes worldwide.

The establishment of a WMO/RTC (Module 1) is, according to this evaluation, the outcome facing major challenges for a successful consolidation and long-term sustainability, especially on its formal educational component supported by UNALM. In a good measure, this is due to strict and large inertia of the academic regulations in force in Peru - as in most countries – which constrains UNALM capability to timely modernise and update its academic programs to adequately respond to the scientific and technological challenges that a well-designed curricula in Meteorology and Climatology poses. This constrain largely limits the ability of the active Meteorology Degree to integrate in the curricula the competencies required for educating students in climatological topics orientated to the elaboration of climate services,

being a clear shortcoming that has been addressed by the RTC by means of organising capacity development activities supported by SENAMHI and by elaborating e-learning modules supported by the UniBe, the MeteoSwiss' subcontracted partner, to cover the deficiency of the required know-how in climatological analysis and applied meteorology.

Another shortcoming is the limited human and technological resources at the UNALM for fostering the research component and post-graduate studies that the production of robust climate products and services require, although some steps have been taken to increase the number of well-trained trainers to face the educational challenges. However, a major involvement of UNALM authorities to more decidedly support the RTC and ensure a long-term vision of its role should be pursuit under ClimAndes P2.

And thirdly, some deficiencies and delayed results can be also identified for the Outcome 2. These evaluators think that this fact can be explained by the complexity of the processes integrated in the elaboration, implementation and communication that opportune climate services deployment requires. The consubstantial challenges are aggravate by the constraints posed by the rigid Peruvian regulations.

Main shortcoming is related to the operational implementation of exploratory climate services for the two pilot regions and in the definition of a plan to engage policy makers at the different political levels to be persuaded of the need for further supporting climate services in Peru. *The implementation of useful and usable climate products and services requires, first, a solid know-how and adequate infrastructural and technological resources to elaborate and provide the identified climate products and services; second, a good diagnosis of the needs and requirements of the end-users and decision-makers; and, third, a well-planned communication strategy to involve stakeholders in further supporting the climate services needed.*

Although the scientific and technical knowledge is being acquired by the provider (SENAMHI) and a good diagnosis of the needs and requirements for climate services in both pilot areas (Cusco and Junin) has been gained from the consulting study carried out, only pilot climate monitoring and forecast products have been provided or are being elaborated to be provided. This lack in the delivery of user-oriented products and services plays against making a strong case among decision makers about the usefulness and benefits of using climate services. Ultimately, only well-proven and fact-based benefits of using climate services for decision making will persuade the actors on the need to bet and regularly support the elaboration and dissemination of such products and services. This other shortcoming must be also addressed in ClimAndes P2, if finally approved.

3. Detailed evaluation of CLIMANDES Outcomes (Modules 1 and 2)

In this section, the evaluators provide detailed insights on the relevance, efficacy and efficiency, impact and sustainability of the results achieved under ClimAndes P1 for its two major outcomes, namely a) Module 1 and b) Module 2, addressing both aspects in two different sub-sections for the sake of clarity.

Through section 3, the efficiency is discussed in semi-qualitative terms and labelled as *High, Medium or Low Efficiency* outcome, which are afterwards compared with the budged allocated to determine the ratio cost/efficiency (classified *as Very Satisfactory, Satisfactory, Less Satisfactory and Unsatisfactory*). In general, efficiency of ClimAndes P1 is high, with many actions designed and executed correctly to achieve the objectives, although with different degrees of efficiency, while others are programmed, but still pending.

3.1. Detailed evaluation of the results from Module and Outcomes 1 (A Regional Training Centre to prepare staff specialised in Meteorology and Climatology for the public)

The Module 1 envisages and integrates four key areas of activity designed to ensure successful outcomes for the establishment of a WMO/RTC in the Andean Region and to provide well-trained and prepared professionals to be able to respond to the need for providing robust climate products and services. All four activities are coherent and highly relevant to ensure the expected outcomes and respond to the ClimAndes end objective and goal, such as described next.

All the activities envisaged and carried out under the Outcome R.1.1. *Providing education, specialization and training in meteorology and climatology to undergraduate and postgraduate students* can be assessed as very relevant and opportune, since they are defined and intended to ensure a good knowledge of current and future educational and training needs, restructuring the training curricula at UNALM in the light of the scientific and technological regional needs and challenges in Meteorology over the Andean region. The implementation of e-learning infrastructure for self-training in climatological topics and to impel the cooperation between other South America RTC and NMHS in the neighbouring region is also other very relevant result for seeing accomplished the envisaged end-goal of establishing a highly-reputed WMO/RTC.

Similarly, the relevance of all five activities programmed under the Outcome *R.1.2. Enhancing institutional training capacities and acquiring skills in meteorology and climatology for students, teachers (RTC) and SENAMHI forecasters* are perceived as very relevant to attain the

end goal for building up institutional training capabilities at the Peruvian beneficiary's partners, in order to ensure that scientific and technical capabilities and skills to elaborate high-quality climate products and services are met by the personnel at the RTC/UNALM and SENAMHI.

Another outcome, the *R1.3 Facilitating exchanges of teachers and students for transferring knowledge and experience* in its two activities, is seen as highly relevant to support and upgrade knowledge and scientific skills of some of the UNALM trainers and generate the required ability to undertake and impel sound research, as well as the efforts placed to attract foreign students.

Finally, the specific outcome *R.1.4 Meteorology training for schools, including teachers of basic education in rural Andean areas* and its related R.1.4.A, R.1.4.B and R1.4.C activities are also appreciated as highly relevant to attain an improved outreaching national capability in all the educational levels to include the importance of assessing relationships between meteorological and climatological features and their influence and impacts in the dynamics of natural and human systems. The remaining activities – R1.4.D and R1.4E – do not seem to be relevant under this outcome, as they are more intended to support outcome R.1.2 than R.1.4 itself.

At the same time, the effectiveness of the Outcome 1 and its specific four main results along with their activities can be qualified as high, since the four sub-outcomes defined in the project are pertinent and coherent to attain the expected objectives set in the logical framework of the project. This is particularly true for effectiveness of the activities programmed under R.1.1, R.1.2 and R1.3, but with less extent for R.1.4, since some of its activities (e.g. R.1.4.D and R.1.4.E) don't seem to be opportune to attain the expected results of deploying outreach activities that highlight the importance and need for including meteorological and climatological knowledge in other initial educational programmes, since both are intended to create personal and institutional capabilities for elaborating and providing forecasting and warning products and services.

Efficiency of the expected results for Outcome 1 is high and the ratio cost-efficiency satisfactory in overall, as indicated in Table 1 in which the efficiency assessment for each activity is provided. The most efficient and cost/effective specific objectives of Outcome 1 are R.1.3 and R.1.1, having estimated for them a high efficiency and cost/efficiency metrics, followed by R.1.4 and R.1.2, which have only reached medium efficiency and a satisfactory rate

cost/efficiency, pointing to the need to readdress and support better the specific objectives and activities involved.

Although overall high efficiency and very satisfactory rate cost/efficiency of R.1.1 objectives, in the case of R.1.1.C (modular design and implementation of e-learning courses in Meteorology), we have considered the e-learning platform has been endowed of an efficient design and its contents are scientifically sound, but a deviation from the objective agreed in the SDC ProDoc for developing three e-learnings modules addressing contents of Dynamical Meteorology, Physical Climatology and Applied Meteorology and Climatology has been identified. Therefore, we have considered a medium efficiency and a less satisfactory rate cost/efficiency due to high cost of the two e-learning modules provided and its limited use perspective.

In addition, some implementation issues might be highlighted to justify the qualifications given to the e-learning activity. First, the fact that the two e-learning modules are not credit granted topics at the UNALM Meteorology degree and have been mainly used by UNALM teachers and students in a volunteer manner and by the SENAMHI personnel to refresh and reinforce their climatological knowledge, sheds doubts about its cost/efficiency. Besides, other issues, such as the language used – English – and being supported by a license required platform, limit the long-term efficiency of the e-learning modules provided. This, along with the need of ensuring an adequate management, experts support, easily accessible and updated e-learning platform should be addressed in ClimAndes P2. *Therefore, it is highly recommendable to address these issues if the beneficiaries want to optimise and extend its usage to a wider audience.*

Efficiency and cost/efficiency for R.1.2 specific objective is medium and satisfactory, respectively, for the five activities to enhance training capacities and technical skills of the UNALM academic staff and students and professionals at SENAMHI, with the weaker efficiency and cost/efficiency for R.1.2.C and R1.2.E activities, since although some effort has been placed to gain funding support from the Peruvian PIP funds, the submission of only a bid points to a low level of activity to get external funding. Similarly, publication of scientific results in international journals activity (R.1.2.E) has a medium efficiency and less satisfactory rate cost/efficiency, which points also to the need for improving the activity by paying more attention to publish the results of the scientific activities to carry out.

As said, R.1.3 specific outcome and activities have been qualified as being high efficient and a very satisfactory rate cost/efficiency has been provided, since all the actions have been undertaken and fulfilled as planned.

Although R.1.4 objectives and activities have an overall high efficiency and satisfactory rate cost/efficiency, attention has to be placed to further impel the warnings of high-impact weather events activity (R.1.4.E), the integration of meteorological and climatological knowledge into the initial and basic educational curriculum activity (R.1.4.B) and in the capabilities for short-term forecasting activity (R.1.4.D).

Table 1. Evaluation of the efficiency of the objectives and activities envisaged under Result 1 of the ClimAndes project on its P1

	Cost (kCHF)	**Efficiency**	**Cost-Efficiency**
R.1.1: ***Providing education, specialisation and training in Meteorology and Climatology to undergraduate and postgraduate students***	342	HIGH	
R.1.1.A Assessing current and future needs of meteorologists and other stakeholders, with emphasis on the high Andean areas and specialized training related to regional labour demand	104	HIGH	
R.1.1.B Evaluating and restructuring the training curricula of meteorologists at the RTC in the light of regional needs and scientific and technological developments in meteorology	107	HIGH	
R.1.1.C Modular design and implementation of e-learning courses in meteorology	131	MEDIUM	
R.1.1.D Cooperation exchange agreements with other RTCs and Meteorological Services		HIGH	
R.1.2 ***Enhancing institutional training capacities and acquiring skills in meteorology and climatology for students, teachers (RTC) and SENAMHI forecasters.***	347	HIGH	
R.1.2.A A Setting up teaching teams at UNALM and SENAMHI	35	HIGH	
R.1.2.B Training and specialization of UNALM teaching staff and SENAMHI practitioners to improve weatherclimate forecasting capabilities for Andean areas	181	HIGH	
R.1.2.C Formulating Public Investment Projects (PIP) to finance the implementation of laboratories and infrastructure in UNALM and SENAMHI	15	HIGH	
R.1.2.D Producing and disseminating applied research	7	MEDIUM	
R.1.2.E Publishing scientific results in international scientific journals	109	MEDIUM	
R.1.3 ***Facilitating exchanges of teachers and students for transferring knowledge and experience.***	140	HGH	
R1.3.A A Identifying qualified candidates for internships and master's degrees in Switzerland		HIGH	
R1.3.B Courses at UniBe for one doctorate student or two master's degree students from UNALM	140	HIGH	

R.1.3.C Attracting foreigner students for RTC/UNALM		HIGH	
R.1.4 ***Meteorology training for schools, including teachers of basic education in rural Andean areas***	584	HIGH	
R1.4.A Designing a training curricula for technical staff	4	HIGH	
R1.4.B Incorporating meteorological issues into the basic educational curriculum and training primary school teachers (helping to popularize meteorology)	310	HIGH	
R1.4.C Assessing current and future needs	68	HIGH	
R1.4.D Enhancing short-term forecasting capabilities	110	HIGH	
R1.4.E Improving high-impact weather event warnings	92	MEDIUM	

VERY SATISFACTORY
SATISFACTORY
LESS SATISFACTORY
UNSATISFACTORY

With regard to the impact of the expected Outcome 1, ClimAndes has been instrumental in the identification of a regional market of students in need of education for the provision and use of climate services. The regional nature of the RTC at UNALM requires such international market and the Andean region, not excluding other Spanish speaking countries in South America, ensures a potential source and input of students to guarantee the viability of the RTC, as long as a good management and long-term vision of its role are assured by UNALM authorities and RTC responsible.

Another important impact of the development of the objectives of Result 1 is to place in evidence the necessity of consolidating UNALM's academic staff beyond the professional career of today's faculty, as well as the necessity of an in depth reformulation of the curriculum currently offered. In this regard, the reformulation of the curriculum of the Meteorology Degree bears in mind the professional provision and use of climate services. This reformulation has focused on adapting the Meteorology Degree to the competencies requested by WMO-258 for the acquisition of the Basic Instruction Package in Meteorology (BIP-M). Although these competencies do not fully meet the professional capacities needed to provide climate services, the future orientation of the studies towards the provision of professional services is seen as very positive impact of ClimAndes.

The impact of the reformulation of the curriculum in Meteorology at the UNALM will not be perceived in the short term, due to the slow nature of the processes of modification and implementation of official higher education plans. It is worth to mention that should not the Peruvian academic authorities authorise the pending modification, the reformulation effect and the associated impact would be almost entirely lost.

ClimAndes also includes shorter term and more flexible capacitation activities, which can support, as complementary resources, formal education and help to introduce novel approaches into the classroom. Actually, the evaluators think that the specialised training and capacity development activities have been crucial to meet the scientific and technical knowledge required for the elaboration of climate services by the trained personal at SENAMHI. In addition, two high quality e-learning modules have been provided and are ready for use in the classroom. If the language barrier is overcome (they are currently formulated in English), their impact is perceived as very positive, since they funnel the lectures of world-class scientists into the classrooms at the UNALM. The topics covered by the e-learning modules projected and effectively created by the University of Bern – "Climate Observations" and "Data Products" – contribute to fill the gap between traditional meteorology (as currently taught at UNALM) and the basic knowledge necessary for climate services provision.

Nonetheless, this positive impact is also limited as the duration and contents of the e-learning resources is, as of today, modest and many more aspects should be covered to rely on this resource as a true complement for formal education. Yet another limitation to the actual impact of the e-learning modules as a complementary tool for the Meteorology Degree is that UNALM authorities are not ready and cannot recognise them as credit granting activities. Due to this fact, the modules are used in a volunteer basis by UNALM students and teachers and particularly by SENAMHI and other Peruvian organisations personnel.

On the contrary, a further advantage of the e-learning modules is their feasibility for capacitation of professionals whom do not require – or do not have the possibility – of following classroom teaching. In this regard, the assessment activities of the pilot e-learning modules developed during ClimAndes provided training to regular UNALM Meteorology students, but also reached professionals from SENMAHI-Peru, SENAMHI-Bolivia, CORPAC, DIRMA, as well as UNALM professors. Even though the positive impact of the e-learning modules provided by UniBe, it seems to have been a deviation from the committed at the SDC ProDoc agreement, since there were envisaged to provide (1) Dynamical Meteorology, (2) Physical Climatology and (3) Applied Meteorology and Climatology e-learning modules when only the aforementioned two climatological modules have been provided by UniBe. This absence should be addressed in ClimAndes P2, if the project wants to ensure a complementary self-learning platform to address lack of the required climatological knowledge.

The activities in Module 1 have had a positive impact in the capability of the region to provide climate services, although important difficulties need to be overcome, such as those related to data communication and infrastructural capacity before a full and effective implementation

takes place. The latter deficiencies will have a negative impact to accomplish successfully the elaboration and delivery of pilot climate services for both Peruvian pilot areas (R.2.2.C activity), as committed in the SDC ProDoc.

The Workshop on Hydrometeorological Warnings was successful in identifying the-state-of-the-art of the hydrometeorological warnings in Peru and their current use by decision makers, as well as the role of the different institutions involved and the users' needs. The workshop was able to formulate recommendations in term of capacitation, climate data, and communication with users' requirements, and those recommendations found a pro-active reaction by professionals at SENAMHI. The participation of the decision-making institutions was limited, further stressing the importance of outreaching and communication of the potential benefits of climate services. Two additional Module 1 workshops were conducted on the topic of Nowcasting for very short-term forecasting.

Nowcasting techniques were, before these capacitation activities, in an embryonic stage at SENAMHI. ClimAndes training activities have identified many areas of application where nowcasting is crucial for supporting decision making. Professionals from SENAMHI, the CORPAC, the DHN, and representatives of the NMHSs of Argentina, Bolivia, Chile, Ecuador, Paraguay and Uruguay were trained in nowcasting. The Peruvian trainees are at this point capable to "learn by doing" if data communication and infrastructural problems to support the production of nowcasting products are overcome. Specialised capacity development activities and tailored training have been proven, therefore, as one of the Module 1 results having a higher impact and benefits to support the elaboration of reliable climate services envisaged under Module 2.

The sustainability of the activities developed in ClimAndes P1 to ensure the provision and use of climate services has to be seen under different scenarios. The first and most favourable is in the presence of further external funding arriving from the Swiss cooperation (CLIMANDES P2 and beyond). The second is in absence of funding arriving from the Swiss cooperation and the third is without any external resources. In general, it is very unlikely to sustain the current level of activities under this later scenario. The need for further external aid is clear and ClimAndes P2 seen as extremely necessary. The path of excellence followed during ClimAndes P1, and expected to continue if ClimAndes P2 takes place, will facilitate future sustainability of the project and increase its attractiveness to pull further funding, as well as increasing the institutional capacity of the local institutions to attract additional resources.

In relation to the sustainability of the expected Outcome 1, *Formation of human resources specialised in meteorology and climatology*, this evaluation considers highly difficult to sustain the activities started in ClimAndes P1 without any external resources, either from national or international donors. Sources of unsustainability are related to human resources themselves, to the internationalisation of the centre and to the autonomous consolidation of the results attained.

The Science School personnel at UNALM were identified at the beginning of the project to be on average at the latest stages of their career. It is crucial for the maintenance of the RTC to ensure their future replacement. The capability to attract high-level scholars and/or recognised professionals in the fields of Meteorology and Climatology is directly linked to the attractiveness of the salary and working conditions offered. If these conditions are not competitive compared with other jobs in the country and abroad, the difficulties to replace the Faculty members might compromise at the mid-term the sustainability of the RTC/UNALM, especially in what involves formal education.

One of the advantages of the e-learning modules is, by definition, the possibility of reusing them in absence of the original educator. In this regard, the activities related with currently available e-learning modules are fully sustainable, even in the absence of further external cooperation. Nonetheless, a learning experience based on remote materials is always more profitable when its contents are regularly updated, and it is facilitated instead of being fully autonomous. For this reason, to the concerns expressed about the sustainability of the School in the near future, further concern has to be expressed on the identification of trainers capable to update, support external queries and maintain the modules in the near future. Most of the difficulties expected in this arena are not related to the local capability for identifying and developing scientific contents to update and expand the modules, but to the technical solution based on proprietary software and the fact that its use is not straightforward without specific training.

Another concern in relation to the sustainability of the activities of the RTC is the time elapsed before official consolidation of the restructuration of the Meteorology Degree and the consolidation of the training materials prepared under the umbrella of ClimAndes into the official courses. At this moment these materials are isolated educational resources and are not integrated into a proper learning solution. Delaying these processes might result in a loss of momentum and lack of perception by future students and trainees at the RTC/UNALM as an attractive destination to pursue a career in Meteorology or be trained in the provision of climate products and services. This process is independent of the availability or not of external

funding. The international exposure of UNALM thanks to the existence of the WMO/RTC and the international partnerships built thanks to ClimAndes should play in favour to facilitate this consolidation.

The activities developed under ClimAndes in relation to the RTC/UNALM are intended to the reinforcement of the RTC. Although the current reputation of the Peruvian RTC does not put in jeopardy its continuity at the present moment, a full consolidation must rely on a sustained attraction of international students. ClimAndes activities have already attracted a limited number of foreign students and identified a market of potential students of sufficient size to justify and maintain a RTC focused on formal education in Meteorology, but more specifically in educating and training for the provision and use of climate services. The RTC/UNALM has to compete and share this market with other RTCs and WMO/Regional Climate Centres (RCC) and institutions providing education and training in South America. Other RTC in the WMO/Regional Association III –Brazil – and RCCs – Argentina and Ecuador – offer or have the capability of offering attractive training courses in similar fields than RTC/UNALM. In the case of Brazil, there is a long-lasting tradition of Peruvian students being formed in this country. ClimAndes related activities should be taken as an opportunity to build for the RTC a reputation and specialisation in education and training in the field of climate services. Again, further cooperation and external funding is necessary, as well as the participation of key international and regional agents, such as the WMO and its Regional Office for the Americas, to inspire its vision and guide its consolidation.

The RTC has reached through ClimAndes P1 an increasing but improvable number of international students. To reach and sustain figures comparable with other top-class RTCs, the RTC/UNALM should present an attractive and regularly scheduled program of formal education. But above all, the RTC should define and attractive program for punctual and tailored training and capacity development activities, and much more attention should be paid to Climatology and climatologically relevant topics. Although the points raised in this paragraph are mostly related to policy and thus could be solved in any funding scenario, the attraction of international students has a high cost. To overcome it, it is necessary to design a sustained grant program and stress the importance of facilitated e-learning solutions. Both aspects need, at this point, additional external funding for sustainable consolidation.

3.2. Detailed evaluation of the results from Module and Outcomes 2 (Public bodies using climate information properly for decision-making through "GFCS twinning")

The ClimAndes Module 2, aimed at promoting the usage of climate information to support decision making by public bodies considering the logical framework of the GFCS and including four main specific objectives, is the most ambitious outcome. It also carries the highest potential impact to successfully attain the goals of ClimAndes P1. Outcome 2 is designed to *identify useful and opportune climate products and services intended at satisfying the State and private stakeholders demands* (R.2.1), *implementing pilot climate services in the two Peruvian pilot areas* (R.2.2), *building a communication network between the provider (SENAMHI) and decision makers* – the public and private-sectors decision makers – (R.2.3) and *developing a system for disseminating climate information among stakeholders* (R.2.4).

The four specific objectives are well articulated, very relevant and effectives to achieve the main objective. They are largely interlaced and interconnected, since the successful implementation or not of the activities scheduled in one specific objective will influence positively or negatively in the successful achievement of the other related specific objectives. This interdependence among the four specific objectives can be a factor compromising and putting at risk the level of accomplishment of the related activities, since delays in implementing an interconnected activity will negatively impact in the achievement of the others interrelated activities. In addition, this Outcome and some of its activities are still under implementation and envisaged to be carried out during the last year of the extended-project on its P1, which will have an impact on its evaluation.

All four specific objectives are, however, highly relevant to reach the end goal of the Outcome, but either by interdependence related constrains or due to the unrealistic pre-assumptions made for the second objective, the evaluators have doubts on the effectiveness of the activities programmed. For instance, to implement pilot services for the pilot areas (R.2.2.C), it is previously necessary to have successfully achieved the activity R.2.1.A, designed to know the demands and needs for climate services in the Andean region and Peru. Any delay occurred with the achievement of the latter activity will compromise the implementation of the pilot services over the targeted Peruvian areas. Besides, to see accomplished R.2.2.C, it is also necessary to have successfully achieved R.2.2.A activities, aimed at developing climate time-series of quality and homogeneity proven, and R.2.2.B, intended to calculate climate change indicators. To attain the expected results in these two interrelated activities to R.2.2.C will require ensuring that the knowledge acquired thanks to the relevant capacity development training carried out under Module 1 is well implemented at work; what, at the same time, will require to solve significant practical, technical, infrastructural and technological application issues, what compromises the successful achievement and effectiveness of both activities.

However, in terms of assessing the efficiency of the activities' results for Outcome 2, the overall efficiency ranges from medium to high and it has a satisfactory rate cost/efficiency. Table 2 shows the estimated efficiency and cost/efficiency rates for Outcome 2.

The less efficient actions of the Outcome 2 are, then, those tightly interrelated to the design and implementation of suitable dissemination mechanisms and climate services delivery over the two pilot areas (R.2.4 activities), along with building communication networks between the provider and decision-makers and end-users (R.2.3). Few actions have been carried out to involve stakeholders in these processes, although some are designed to be carried out during the last year of P1, what partially explains a reduced level of achievement.

Besides, we want to indicate the low efficiency and unsatisfactory rate cost/efficiency of the project management processes and actions, due to the already mentioned reasons: slowness and delays in internal decision-making and poor management practices at both main beneficiaries. This aspect is especially significant because this poor project coordination and management is supported by a substantial part of the whole budget, which is more than the 26 % of the total project budget, what points to a less satisfactory rate cost/efficiency.

Efficiency is high and satisfactory for R.2.1, particularly for its activity R.2.1A, intended at the identification of the demand from the State and private stakeholders for climate services. For this activity, a high efficiency and very satisfactory rate cost/efficiency have been estimated. However, results from R.2.1.B (to prioritise key requests and design climate services in both pilot areas) point to a low efficiency and less satisfactory activity in terms of its cost/efficiency, since little effort has been placed on its execution so far.

For the specific objective R.2.2, a medium efficiency and satisfactory rates cost/efficiency have been estimated, despite the difficulties mentioned above. It is particularly remarkable the high efficiency and very satisfactory relationship cost/efficiency of the implementation of the QC and homogenisation procedures for generating high-quality climate time-series for both pilot areas (R.2.2.A activity), followed by R.2.2.F activity (transferring and exchanging methodologies for climate services) with a high efficiency and very satisfactory rate cost/efficiency and by R.2.2.E activity – developing a visualisation website for climate change indicators – which has achieved a high efficiency and satisfactory rate cost/efficiency, although an improved management, visibility and accessibility to the portal must be sought in the remaining time of the P1 execution and in P2. On the opposite, a low efficiency and unsatisfactory rate cost/efficiency have been estimated for the activity aimed at implementing pilot services in the targeted Peruvian regions (R.2.2.C) due to the limitations aforementioned

and the late start of the field trial to identify users' needs in both pilot areas related to administrative problems at SENAMHI imposed by inflexible Peruvian regulations. Whilst activities R.2.2.B (calculating climate change indicators in the context of the pilot areas) and R.2.2.D (publishing scientific results in international scientific journals) a medium efficiency and satisfactory rates cost/efficiency have resulted from the assessment, partially related to the fact that some of these activities are still pending implementation during the last project year.

For the specific objective R.2.3, aimed at building communication networks between SENAMHI and private sector decision-makers, an overall medium efficiency and less satisfactory rate cost/efficiency have been estimated. Only a medium efficiency and satisfactory rate cost/efficiency has been estimated for R.2.3.A activity (diagnosing communication problems on climate services and products for decision-makers), while for the design of suitable mechanisms and products for communication (R.2.3.B activity), a medium efficiency and less satisfactory rate cost/efficiency has been returned from the efficiency analysis. The new activity incorporated by SENAMHI in ClimAndes logical framework (R.2.3.C: implementing appropriate communication mechanisms and products in the pilot areas for decision-makers), after reviewing internally weaknesses of the project on its P1, has got low efficiency and less satisfactory rate cost/efficiency metrics, as expectable from its late identification and by the fact it is on its initial stages of execution.

Finally, from the efficiency assessment made of the activities under the specific objective R.2.4, which has an overall medium efficiency and satisfactory rate cost/efficiency, highlights the high efficiency and very satisfactory rate cost/efficiency of the R.2.4.D activity, intended to make informative summaries of technical information of SENAMHI for massive diffusion; meanwhile R.2.4.E (to enhance communication mechanisms and products for decision-makers) is seen as having a low efficiency and less satisfactory rate cost/efficiency activity among the others activities within this specific objective, since all the other activities, R.2.4.A (setting up a climate reporting network with strategic coverage), R.2.4.B (incorporating local media for broadcasting climate and environmental information) and R.2.4.C (developing user-friendly information templates for decision-makers and the general public) have been assessed as having medium efficiency and satisfactory rates cost/efficiency.

Table 2. Evaluation of the efficiency of the objectives and activities envisaged under Result 2 of the ClimAndes project on its P1

	Cost (kCHF)	Efficiency	Cost-Efficiency
R.2.1: ***Identifying climate services according to demand from the State and private stakeholders***	55	HIGH	
R.2.1.A Qualitative study of demands and needs for climate services in the Andean region of Peru.	35	HIGH	
R.2.1.B Prioritizing key requests and design of climate services in pilot areas based on the demand identified (Cuzco and Junín).	20	LOW	
R.2.2: ***Implementing climate services in pilot areas (Cuzco and Junín)***	789	MEDIUM	
R.2.2.A Quality control and implementation of automated data homogenization in the pilot studies.	331	HIGH	
R.2.2.B Calculating climate change indicators in the context of the pilot areas	291	MEDIUM	
R.2.2.C Implementing pilot services in the southern and central Peruvian Andes.	75	LOW	
R.2.2.D Publishing scientific results in international scientific journals.	43	MEDIUM	
R.2.2.E Developing a website for viewing climate indicators.	29	HIGH	
R.2.2.F Transferring and exchanging methodologies for climate services.	20	HIGH	
R.2.3: ***Building a communication network between SENAMHI and public and private-sector decision-makers***	12	MEDIUM	
R.2.3.A Diagnosing communication problems on climate services and products for decision-makers.	6	MEDIUM	
R.2.3.B Designing suitable mechanisms and products for communication with decision-making users.	6	MEDIUM	
R.2.3.C Implementing appropriate communication mechanisms and products in the pilot areas for decision-makers		LOW	
R.2.4: ***Developing a system for disseminating climate information to public and private-sector decision-makers***	41	MEDIUM	
R.2.4.A Setting up a climate reporting network with strategic coverage.	5	MEDIUM	
R.2.4.B Incorporate local media for broadcasting climate and environmental information	16	MEDIUM	
R.2.4.C Develop user-friendly information templates for decision-makers and the general public	8	MEDIUM	
R.2.4.D Make informative summaries of technical information of SENAMHI for massive diffusion	4	HIGH	

R.2.4.E Enhance communication mechanisms and products for decision-makers.	8	LOW	
Coordination and project management	825	LOW	

VERY SATISFACTORY
SATISFACTORY
LESS SATISFACTORY
UNSATISFACTORY

The activities conducted to achieve the Outcome 2 have mainly contributed to attain a good knowledge about the needs and requirements of decision-makers and end-users for opportune and useful climate products and services use over the two pilot Peruvian areas (Cusco and Junin). This successful activity along with the know-how gained by SENAMHI personnel in the specific training enabled by Module 1 have had a positive impact in the development of scientific and technical capacities to produce robust and opportune climate products and services, as well as they have enhanced the institutional capabilities to better manage and disseminate the climate services to be provided.

Module 2 activities have done remarkable progress in terms of climate database and climate data management system improvement, reinforcing the institutional capacities at SENAMHI, to have included in the national databank the procedures learnt in the trainings. This is a result of high impact as it is considered the foundation for the provision of any high-quality and dependable climate service. The activities – conducted in alliance among the Statistical, Climatological and IT Units at SENHAMI and the twin climatological groups in MeteoSwiss and MeteoDat – have added a new, unforeseen and of high and long-term impact activity with the focus placed on enhancing historical data availability through Data Rescue (DARE) procedures. This includes original data preservation, logbooks duplication (imaging) and digitisation activities, which are and will be substantial to enhance in the present and future the basic input – the data – for providing a more complete set of reliable climate products and services for across the country.

In addition, the training in quality control (QC) and homogenization of climate time-series has had a positive impact not only at SENAMHI, but also at others NMHS in the region, improving their capabilities to generate high-quality climate time-series. The process has also reinforced the SENAMHI institutional capability for carrying out the best practices in climate data management. The impact of these activities is very high considering the overall development of the project, but entirely depends on continuing the institutional consolidation of these activities and processes, which seems highly likely at present thanks to the support and determination of current directive team at SENAMHI for introducing them into operational

routines. At least, the articulation and coordination work among the three SENAMHI Units – the Statistical, IT and Climatological – indicates sustainable progress in this way.

The activities conducted to achieve the Outcome 2 need, in general, further external support to achieve sustainability and will benefit from ClimAndes P2, if it takes place.

First, as happened with the Outcome 1, a consideration on staffing and sustainability of the activities must be made, since the personnel working for ClimAndes have to share these project activities with their quotidian duties at the service. Although no aging problem seems to menace the future stability of the staff, internal promotion and/or exchanges between departments can set a drawback to the sustainability of the activities started under ClimAndes P1. This problem can be overcome in good measure by working on the development of institutional capabilities, as mentioned in the previous paragraph, in opposition to simply training a person or group of individuals. Of course, the consolidation of the RTC/UNALM and the establishment of a specific, continued and regular training program must contribute to insert in the institutional culture of SENAMHI the know-how and the tools to produce in a sustainable way adequate climate services and to effectively transmit them to society and policy makers.

A good example of progress towards sustainability of the activities fostered by ClimAndes P1 is the observed in the fields associated with DARE, QC and homogenisation. The process of developing high quality and homogeneous climate time-series suitable for the production on a regular basis of climate products and services has experienced a significant boost through the project and the cooperation with MeteoSwiss and MeteoDat. At this point the state-of-the-art processes for DARE, QC and homogenisation are being operationally implemented at SENAMHI and the institution has interiorised on its culture the need to dedicate human and material resources to them, aspect largely facilitated by ClimAndes, but also supported by SENAMHI own resources. The capacity built in the institution would suffice to continue with these activities even without further cooperation, not without facing significant technical and practical issues. ClimAndes P2 or any other source of external cooperation, in terms of scientific and material input, will result in a significant improvement of these activities and in maintaining the trend towards excellence initiated with ClimAndes P1.

With regard to the activities carried out to implement structures for nowcasting and hydrometeorological warnings, progress has been done, although the degree of development attained at the end of ClimAndes P1 cannot ensure the sustainability without the intervention of a second phase of the project and/or additional external funding coming from other

sources. The different workshops conducted around this topic (Nowcasting en Zonas Andinas I & II and Taller de Avisos Hidrometeorológicos) have trained the academic staff of the Meteorology Degree at UNALM and the operational forecasters of SENAMHI in a field that was in deep need of development, as mentioned in the former sub-section. Before the sustainability of the implementation of nowcasting activities can be ensured, more capacitation is needed, as well as important improvements in data access and sharing protocols and technical infrastructures that permit climate data and services fast interaction. A second phase of ClimAndes is necessary to start implementing and sustain nowcasting activities and, most likely, additional funding would be required to ensure the availability of the necessary infrastructures.

Further planning is needed to reach policy and decision makers at different levels: from responsible of the state, regional and local institutions to local communities and small business. ClimAndes P1 has met with stakeholders from different sectors of activity (e.g. tourism, health, agriculture) at both pilot areas, but further effort is necessary in this regard to involve relevant policy and decision makers.

Through this sub-section, the necessity to stress policies ensuring the provision of climate services has been raised, as well as the need in most cases of additional funding. Indeed, at the mid and long term, climate services related activities will be sustainable as far as there is national and international political and societal interest on them and as far as they demonstrate to be of economic and societal value. For this reason, the sustainability of the activities started with ClimAndes P1 will be easier to attain by improving networking between the provider and stakeholders, increasing outreach and dissemination activities, either to demonstrate the economic value of climate services or to educate in their understanding and use.

4. Conclusions

The External Evaluation assignment has successfully enabled to identify strengths and weaknesses, along with the threats and opportunities to ensure sustainability into the future, in the implementation of ClimAndes P1 and assessed the relevance, effectiveness and efficiency, impact and sustainability of the activities included in all the specific objectives of both main expected outcomes.

The evaluators got an overall good impression of the reasonable impact and benefits already achieved under ClimAndes P1 in both main objectives and related outcomes, based on the

substantial steps taken to pave the way and ensure in the long run that Peru and the Andean region have the capabilities to elaborate and timely delivery useful, robust and opportune climate products and services to support decision-making by involving the relevant stakeholders. The evaluators consider that ClimAndes P1 has been reasonably successful to pave the way for future production and delivery of climate products and services in Peru and beyond thanks to the enhanced training capacities and know-how gained under its P1, as well as thanks to the institutionalisation of the new capacities acquired by the trained staff in an operational mode.

The ClimAndes project is seen by the evaluators as a solid national and regional contribution to the GFCS-twinning and a valuable contribution to the deployment of climate services in a country and region deeply in need for climate services to reduce vulnerability and increase resilience of the fragile Andean socio-ecosystems. Hence, it has the potential to contribute to and reinforce the public and private adaptation strategies to face present and future impacts of climate variability and change in the region. ClimAndes is a comprehensive and successful GFCS project that integrates all major GFCS components, placing on its core the cross-cutting activities of capacity development and users interface platform, having the potential to guide other countries and regions worldwide from the experiences and lessons learnt during its implementation and can serve as a project-template to be followed by other GDCS communities worldwide. Hence, its global impact is ensured by using ClimAndes as a case-study from where to learn and be applied by others.

The most remarkable achievements of ClimAndes P1 can be summarised as follows:

- The establishment of a WMO/RTC for the Andean region addressing formal and informal educational and training capacity to ensure in the mid and long term an enhanced national and regional availability of professionals and technicians enabled to elaborate high-quality climate products and services
- An increased knowledge, expertise and know-how among the SENAMHI personnel and other relevant Peruvian organisations, including staff from neighbouring NMHS in the Andean region and beyond, in the-state-of-the-art methods and techniques to elaborate climate monitoring and forecasting products and services, thanks to the relevant capacity building activities implemented
- An enhanced institutional capacity at SENAMHI, both scientific, technical and technological, to produce and deliver climate products and services related to the improvement and

integration in an operational basis of the new knowledge and tools acquired by its personnel during the tailored training and capacity building activities

- A set of two well-defined e-learning modules to remotely train interested people in climatological topics that are the basic and initial knowledge to acquire before ensuring a regionally-wide capacity to produce and delivery climate products and services
- A mentionable impact of ClimAndes among the neighbouring countries gained thanks to the capacitation activities organised, which have trained staff from the Andean NMHS and beyond and have enabled the signature of bilateral cooperation agreements with other Andean NMHS
- An improved visibility of SENAMHI as reliable provider of climate products and services among relevant Peruvian governmental bodies
- A better knowledge of policy makers and end user needs and requirements for climate products and services over the two pilot areas of Cusco and Junin, along with an improved climate data quality and availability over these Peruvian regions and the whole Peru, thanks to the newly added DARE activities, along with the generation of high-quality climate time-series facilitated by the operational integration of the new procedures learnt
- An improved know-how in key and basic climate monitoring and prediction techniques that are vital and previous steps before ensuring the production of robust and quality proven climate products and services
- A bettered envisaged strategy to communicate and involve stakeholders and end-users in the usage and relevance of the climatic information applied to their specific needs and an improved capacity to publicly disseminate the relevant climatic information among the end-users
- The implementation of a climate indicators visualisation portal to make possible a friendly and accessible dissemination of climate monitoring products
- All this points to the high potential of ClimAndes to become a global reference in the implementation of national and regional GFCS projects.

Among the deficiencies identified during the external evaluation assignment the following ones must be listed and addressed in ClimAndes P2, if finally supported:

- An inefficient project coordination involving all the main beneficiaries and donor to ensure the smooth deployment of the project, resulting in activities delays due to the prolix and

lengthy processes of the internal evaluation and approval set by the project Monitoring Committee

- A poor, but improvable, project management of both main Peruvian and Swiss beneficiaries to ensure a long-term qualitative vision and fluid exchange of information and results among the project's partners and the society that in the case of SENAMHI is related to the lack of institutional expertise managing international projects and in the case of MeteoSwiss is associated with a lack of the required interaction with and engagement of the WMO partner to better support and respond to the communication and dissemination challenges of the project in the framework of the GFCS
- A politically constrained capability at UNALM to modernise and update its academic programs to adequately respond to the scientific and technological challenges that a well-designed curricula in Meteorology and Climatology pose, due to strict Peruvian regulations, what place at risk the formal education component of the RTC/UNALM to attract foreign students
- A limited integration of climatological topics orientated to the elaboration of climate services at the UNALM official academic programmes that has been partially solved thanks to the provision of two e-learning modules produced by UniBe and the organisation supported by SENAMHI of tailored capacity development training to address the shortcomings
- A constrained efficiency of the provided e-learning modules due to their currently limited use perspective, dissemination and the problems associated with the technical solution of the e-learning platform – based on licenced software – and the lack of support, good management and updating of contents
- The limited human and technological resources at the UNALM for fostering the research component and post-graduate studies that the production of robust climate products and services require, although some steps have been taken to increase the number of well-trained trainers to face the educational challenges
- A limited implementation of exploratory climate monitoring services over the two pilot regions (Cusco and Junin) and a delayed provision of user-oriented climate forecasting services
- A weak planning and scarce activities aimed at engaging policy makers at the different political levels and among decision-makers to communicate and disseminate the usefulness

and socio-economic benefits of the climate services and persuade them of the need to further support climate services in Peru

All these deficiencies have avoided a fully satisfactory implementation of ClimAndes on its first phase and must be addressed in the second phase, if finally funded.

Abbreviation and acronyms

ClimAndes:	Andes-based climate services for decision-makers
CORPAC:	Corporación Peruana de Aeropuertos y Aviación Comercial (Peruvian Coorporation of Airports and Commercial Aviation)
COSUDE:	Agencia Suiza para el Desarrollo y la Cooperación (SDC in Spanish)
DARE:	Data Rescue
DHN:	Dirección de Hidrografía y Navegación (Hydrography and Navigation Directorate)
DIRMA:	Dirección de Meteorología Aeronáutica (Aeronautical Meteorology Directorate)
FURV:	Foundation of University Rovira i Virgili
GFCS:	Global Framework for Climate Services
IT:	Information Technology
Meteodat:	Meteodat GmbH
MeteoSwiss:	Swiss Federal Office of Meteorology and Climatology
MINAM:	Peruvian Ministry of the Environment
NMHS:	National Meteorological and Hydrological Service
PIP:	Public Investment Projects
QC:	Quality Control
RCC:	WMO/Regional Climate Centre
RTC:	Regional Training Centre
SDC:	Swiss Agency for Development and Cooperation
SENAMHI:	Peruvian National Service for Meteorology and Hydrology
UNALM:	Universidad Nacional Agraria La Molina
UniBe:	University of Bern
URV:	University Rovira i Virgili (Tarragona, Spain)
WMO:	World Meteorological Organization
WMO/RTC	World Meteorological Organization/Regional Training Centre

Annex 1: Terms of Reference of the External Evaluation Assignment

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Embajada de Suiza en el Perú

Agencia Suiza para el Desarrollo y la Cooperación COSUDE

TERMS OF REFERENCE CONSULTANCY ASSIGNMENT:
External Evaluation of the Project CLIMANDES Phase 1 (2012 – 2015)

Project Title:	CLIMANDES
Country:	Peru
Organisation:	SDC
Duration of Evaluation:	34 days

A. Context and Introduction

About a decade ago, the UN Framework Convention on Climate Change (UNFCCC) urged that a better understanding, monitoring, modeling and prediction of weather and climate is essential to reduce negative impacts of climate change on humans and the environment. Hence in 2009, the Third World Climate Conference (WCC-3) proposed to create a Global Framework for Climate Services (GFCS) to strengthen the provision and use of weather forecasts, products and science-based climate information worldwide, as well as to help societies to better adapt to the challenges of climate variability and climate change. Within the context of GFCS, the need emerged to exchange products and services between National Meteorological and Hydrological Services (NMHS) on a global level.

For the Andes in the west of Latin America, extreme weather events and climate change are particularly serious threats. Peru is a country that encompasses 28 out of 32 climate zones due to its complex topography, the influence of the Humboldt Current, and its location in the tropics. The provision of adequate climate services requires professionals and technical equipment of high quality. Thereby, scientific education and professional experience are the basis for the establishment of a sustainable system of operational climate products and services.

On the request of SENAMHI Peru, the Congress of the World Meteorological Organization (WMO) recognized the training facilities at UNALM as a Regional Training Centre (RTC) of the WMO for the Western Andes in 2011. This center will conduct programs for the education and training of meteorological and hydrological professionals of Member States of WMO Region III.

In this context, the CLIMANDES project was developed in mid-2012 under SDC's Global Programme on Climate Change and in collaboration with WMO, SENAMHI, and MeteoSwiss. The project aims at contributing to the implementation of the Global Framework for Climate Services (GFCS) and the facilitation of informed decisions addressing the impacts of climate change. Thus the Project

CLIMANDES is one of the pilot projects within the initiative of the new GFCS of WMO. For more information about the Project CLIMANDES, please consult the factsheet in the annex.

B. Objectives of Review

The two main objectives of CLIMANDES are: i) The establishment of a Regional Training Centre (RTC) for the specialized training of meteorology and climatology professionals; ii) Public institutions make appropriate use of climate information and services for decision-making ("GFCS Twinning" or associated work within the GFCS)

Monitoring and evaluation of the Project CLIMANDES has been under the responsibility of WMO. After 3 years of project implementation, an external evaluation is proposed in order to have a better understanding of its relevance, efficiency, impact, and sustainability. In addition, having reached the end of Phase 1 of CLIMANDES, the external evaluation shall include some ideas/recommendations towards the design of a possible next phase of the project.

C. Scope / Focus of Review

The external evaluation of Project CLIMANDES Phase 1 (2012 to 2015) is expected to be conducted between February and May 2015. The following issues are to be considered:

1. Conduct the **Project Evaluation (ca. 30p.)**, applying the five evaluation criteria proposed by the OECD-DAC (www.oecd.org), adapted to the context of CLIMANDES, responding (at least) to the following points:

1.1 Relevance
- 1.1.1 Relevance of the project objectives: To what extent are the objectives of the programme still valid?
- 1.1.2 Are the activities and outputs of the programme consistent with the overall goal and the attainment of its objectives?
- 1.1.3 Are the activities and outputs of the programme consistent with the intended impacts and effects?

1.2 Effectiveness
- 1.2.1 To which extent the objectives have been achieved?
- 1.2.2 What were the major factors influencing the achievement or non-achievement of the objectives?
- 1.2.3 Effectiveness In the approach and strategy proposed by the project
- 1.2.4 Effectiveness in the reach at regional level in the Andes
- 1.2.5 Special review of proposed indicators (suitability, effectiveness, measurability)

1.3 Efficiency
- 1.3.1 Were activities cost-efficient?
- 1.3.2 Were objectives achieved on time?
- 1.3.3 Was the project implemented in the most efficient way compared to alternatives?

1.4 Qualitative and quantitative impact of project CLIMANDES
- 1.4.1 Developed capacities of stakeholders in the Andean Region to address Climate Change
- 1.4.2 Importance/relevance of climate services for decision makers (What real difference has the activity made to the beneficiaries?)
- 1.4.3 Increased use of climate services (How many people use it? How?)
- 1.4.4 Improved climate services (quality and improvement of the type of services)
- 1.4.5 Feedback from users and the impact on public policy

1.5 Sustainability
- 1.5.1 Sustainability of the activities
- 1.5.2 Sustainability of effects or changes promoted

1.5.3 To what extent would the benefits of the project continue after donor funding ceased? (assuming the project would not enter into a second phase)

1.5.4 What were the major factors which influenced the achievement or non-achievement of sustainability of the project?

2. Formulate and justify **Recommendations** for the Project CLIMANDES Phase 2 (5-7 pages), in the usual format of SDC, including at least the following elements:
   1. Background
   2. General observation of the context (international – regional – national)
   3. Identify strengths, weaknesses, opportunities, and threats (SWOT Analysis) of the project
   4. Major lessons learnt phase 1
   5. Ideas/Recommendations for phase 2 ("Vision")

3. Produce **Communication Material**, based on the findings and lessons learnt under the Project CLIMANDES Phase 1, in particular: summary of findings (visual presentation) as infographics depicting results and impacts of the Project CLIMANDES Phase 1

The consultant will present the Evaluation Report of Project CLIMANDES Phase 1, the Recommendations for the Project CLIMANDES Phase 2, as well as the mentioned communication materials on the 28.5.2015 in the context of the World Congress of WMO in Geneva. The Evaluation Report, the Recommendations, as well as the Communication Materials will be agreed on by SDC, WMO, MeteoSwiss, and SENAMHI.

D. Methodology

The consultant will undertake evaluation through the following 3 main steps: 1) review of documentation (home-based); 2) interviews with stakeholders (mission, respectively in-situ team); and 3) follow-up inquiries by phone/email and develop final products (home-based). Before the mission, the consultant will coordinate closely with project responsible at WMO and respective SDC Officer to get necessary documents for home-based desk review and schedule mission appointments.

Review of Documents (Desk Review)

1. Project Document
2. Annual financial and operational plans
3. Annual financial and operational reports
4. Relevant meetings minutes and workshop reports
5. Mission reports, publications (scientific articles, dossiers, factsheets, etc.)
6. Audit reports
7. Monitoring and evaluation framework (log frame)
8. Any other documents deemed necessary

Interviews to be conducted, including at least:

1. SENAMHI
2. MINAM
3. MeteoSwiss
4. Universities (Peru and Switzerland)
5. SDC
6. WMO
7. APSI
8. Beneficiaries in Cusco and Junín

E. Deliverables

1. **Work Plan**, taking the proposed timeline below as a reference
2. **Evaluation Report** of Project CLIMANDES Phase 1 (ca. 30p.), as in C point 1. Presentation and discussion of the report

3. **Recommendations**, as in C point 2
4. **Communication Documents**, as in C point 3

F. Period of Consultancy and Proposed Timeline

The consultancy will take place between February 2015 and end of May 2015 and is mandated by the Global Programme on Climate Change of SDC in coordination with the WMO, MeteoSwiss, and SENAMHI. It is suggested to follow the proposed timeline below. Field visits, interviews, and meetings in Lima and Switzerland will be arranged with the heads of each entity after prior coordination with SDC responsibles in Lima and Switzerland.

Date	Milestone	Working Days
23.2.2015	**Workshop** (WMO, Senamhi, MeteoSwiss)	(1)
6.3.2015	**Work Plan** finalized	1
20.4.2015	**Evaluation Report** of Project CLIMANDES Phase 1 finalised	15
8.5.2015	**Recommendations** for Project CLIMANDES Phase 2 finalized (5-7p)	10
11.5.2015	Draft **Communication Material** finalized	5
28.5.2015	World Meteorological Congress in Geneva. Meeting with SDC, WMO, MeteoSwiss, SENAMHI in Switzerland: Presentation of, and Agreement on, the Evaluation Report, the Recommendations, as well as the Communication Materials	3

G. Selection Criteria and Requirements for Consultant (team leader)

• Master or PhD degree in a discipline relevant to climate science or international development
• At least 10 years of expertise in the planning and evaluation of projects in the field of meteorological services in mountain countries at international level
• Excellent knowledge on structures of climate services in countries of the Andean region
• Extended network and knowledge of actors and their procedures in the field of meteorology and climatology (WMO, the SDC Global Programme on Climate Change, SENAMHI, and other local actors)
• Excellent written and spoken capacities in Spanish and English
• Availability of field visits in the areas of project intervention

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ANNEX 1 Factsheet of Project CLIMANDES

Key project data
Theme Climate change
Country or region Global
Department Global Cooperation
Duration

August 2012 – July 2015

Current phase
August 2012 – July 2015

SDC budget
CHF 3,175,000

Total project budget
CHF 3,636,500

Project number: 7F-08453.01

CLIMANDES project

Reliable and high-quality climate services availability. Key development tool

In a context of climate change, the availability of reliable and high-quality climate services will be a key tool for decision-taking in sectors like agriculture, education, health, tourism, energy and transport.

Context	Climate change and variability is having a growing influence on social and economic development everywhere, particularly in the Andean region – a very vulnerable area because of its geographical characteristics. Extreme weather phenomena (torrential rains, drought and very cold spells) have gradually increased, and have a severe impact on the rural communities that survive on agriculture.
Objectives and outcomes	Given the possible climate change scenarios, the availability of reliable and high-quality climate services will be a key tool for decisions in sectors that are strategic for the Andes including agriculture, tourism, energy and transport. CLIMANDES will also raise the capacity for producing reliable meteorological forecasts and offer high-quality climate products and services that will help decision-taking in those strategic sectors. **Expected outcomes** • Meteorological and climatological training through the Regional Training Centers, for university teaching staff and professional and technical people. • Meteorological and climate information supply will be guaranteed and used properly by Peruvian central and regional government offices. This information will be key for policy-makers to take informed and necessary decisions in sectors such as agriculture, education, health, tourism, energy and transport, regarding the various climate change scenarios foreseen.
Implementing partner	**In Peru**: Peruvian Meteorological and Hydrological Service (SENAMHI) and *La Molina* University. **In Switzerland**: Federal Office of Meteorology and Climatology MeteoSwiss, Meteodat, Berne University (Switzerland). In Paraguay: World Meteorological Organization Mundial (WMO).
Beneficiary group	Local, regional and national public authorities and institutions. Agricultural businesses and government projects. Scientific and academic community. Meteorological services of the west coast of South America.

Monitoring climate change over regions of complex terrain, such as Peru and the Andean area, is a crucial international scientific and political priority. The communities and ecosystems in these areas are unique, fragile and extremely sensitive to climate variations

CLIMANDES

Climate services with an emphasis on the Andes to support decisions

is a pilot project twinned to the WMO Global Framework for Climate Services that aims to enhance the ability of the Peruvian community to respond to the regional impacts of climate variability and change

1

Human-induced climate change may exacerbate current problems of glacier retreat, soil and land degradation, loss of biodiversity and water scarcity of the Andean socio-ecosystems

2

Such changes pose major threats to water supplies, affecting agriculture, livestock and dairy productivity as well as hydropower generation, human health and food production, with the potential to disrupt national economies across the Andean region

3

Rural Andean communities are especially vulnerable to the impacts of climate variability and change due to their dependence on the natural environment and a lack of adaptation strategies

4

High quality climate services are extremely important for Peru to deliver quick responses to extreme events and plan adaptation measures to reduce vulnerability and increase resilience of the Andean socio-ecosystems

5

CLIMANDES is establishing regional and national partnerships to enhanceadaptation strategies and reduce vulnerability to climate impacts, ultimately increasing the resilience of Andean socio-ecosystems

6

A pilot showcase on the socio-economic benefits of climate services for the coffee and maize sector in Cusco was successfully presented at the international COP20 meeting in Lima 2014, making use of this opportunity for high-level communication with political decision-makers

7

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Senamhi

PERÚ Ministerio del Ambiente

Servicio Nacional de Meteorología e Hidrología de Perú - SENAMHI

METEODAT

UNIVERSITÄT BERN

WMO OMM

CLIMANDES // FROM EDUCATION TO PROVISION OF CLIMATE SERVICES

Climate services with an emphasis on the Andes to support decisions

The long-lasting Swiss and Peruvian relationship is now embracing the production and delivery of reliable and opportune climate information

Reinforcing the Regional Training Centre at UNALM provides high-level education in meteorology and the provision of climate services in cooperation with the university of Bern and SENAMHI

SENAMHI, Meteoswiss and Meteodat are working together to develop local skills and provide opportune climate information that benefit society

Reinforced dialogue between SENAMHI and decision-makers identifies the benefits of adopting climate-informed and climate-resilient policies

The provision and use of timely climate information brings important **Socio-economic benefits**

US$ 982M (0.5% of Peru's GDP) is lost annually by hydro-meteorological extremes in the agricultural sector only

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Confédération suisse
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Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Senamhi

PERÚ Ministerio del Ambiente

Servicio Nacional de Metereologia e Hidrología de Perú - SENAMHI

METEODAT

UNIVERSITÄT BERN

WMO OMM

CLIMANDES // ENHANCING EDUCATION AND TRAINING

Climate services with an emphasis on the Andes to support decisions

Supporting the Regional Training Centre (RTC) at UNALM *to educate and train national and international students and professionals in meteorology and climate analysis*

PERÚ // *RTC*

Providing new learning technologies and tailored training to upskill professionals *in the provision of specialised climate information*

500 e-learning users
10 training activities with 300 trainees

Updating the UNALM Meteorology Degree *to train the next generation of skilled Andean professionals:*

150 enrolled students and 38 graduates in Meteorology

Ensuring outreaching activities for all educational levels *in Peru and the wider community*

115 media experts trained and teaching material for all educational levels produced

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Senamhi

PERÚ Ministerio del Ambiente | Servicio Nacional de Metereología e Hidrología de Perú - SENAMHI

METEODAT

UNIVERSITÄT BERN

WMO OMM

CLIMANDES // GENERATING THE BEST CLIMATE INFORMATION TO SUPPORT DECISION MAKING

Climate services with an emphasis on the Andes to support decisions

Recovering Peru's rich climate data heritage:

~ 8.7 M original observations *scanned over the rich mosaic of Peruvian climates, representing all main climate types*

Enhanced ability *to issue and deliver* ***hydro-meteorological warnings and attempts to reduce the warning time from hours to minutes***

Guaranteeing availability and quality of long-term climate data *to produce reliable climate services:*

~ 7M observations quality controlled 342 daily temperatures *and precipitation time-series homogenised*

Improved climate information to benefit society, *saving lives, properties and infrastructure*

At least US$ 11M (US$ 92M) in the coffee and maize sector in Cusco (Junin) had been earned over 10 years, according to the study on the socio-economic benefits of climate services presented at the COP20 meeting

Applying the most innovative analysis to improve climate monitoring and forecasting products*, reducing Peru's vulnerability to climate variability and change*

Increased engagement of climate services provider *with users and decision makers*

60 public and private users involved in Cusco and Junin

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Senamhi

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RECOMMENDATIONS FOR THE IMPLEMENTATION OF THE 2ND PHASE OF THE PROJECT CLIMANDES

ELABORATED UNDER THE EXTERNAL EVALUATION ASSIGNMENT CARRIED OUT BY CONSULTORS

Manola Brunet (Lead)

Enric Aguilar

Javier Sigró

(Tarragona, Spain, May 2015)

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1. Background

Peru and other Andean countries' socio-ecosystems are particularly sensitive and vulnerable to a variety of physical, chemical and biological degradation processes and to the impacts of interannual (and longer timescales) modes of climate variability. Extreme weather and climate events, such as heavy coastal rainfall and the subsequent flash-floods or generalised flooding conditions are associated with changes in the coupled ocean and atmosphere dynamics forced by the ENSO mode of climatic variability and tend to induce negative geomorphological effects and impacts on the affected socio-ecosystems. These impacts have very high socio-economic costs, endangering human lives, infrastructures and properties. In addition, anthropogenic climate change driven by global warming may add to and exacerbate the existing problems of Andean glacier retreat and permafrost thaw, soil salinization and land degradation or loss of biodiversity, increasing the vulnerability of the socio-ecosystems affected. Such impacts pose major threats to water supplies, affecting agricultural, livestock and dairy productivity, hydropower generation, irrigated agriculture, human health and placing at risk food production, having the potential to disrupt the national economies of countries across the region. In the Peruvian agriculture sector only the cost of the hydrometeorological extremes is estimated by the World Bank in US$ 982M (0.5% of Peru's GDP) annually.

To respond to these challenges posed by climate variability and climate change, the National Meteorological and Hydrological Services (NMHS) of Peru and Switzerland, countries that count with a long tradition in cooperation for the development and share similar geographical features of complex terrains, joined their efforts and searched for support to promote and consolidate the elaboration and provision of opportune climate services and products that can be used confidently to better respond to the impacts of climate variability and climate change on the Peruvian socio-ecosystems.

These common efforts resulted in the signature on October, the 21st, 2012, of a project agreement between the Swiss Agency for Development and Cooperation (SDC) and the World Meteorological Organization (WMO) to provide financial assistance to undertake the project "Andes-Based Climate Services for Decision-Makers (ClimAndes)", a pilot project under the WMO-led Global Framework for Climate Services (GFCS) to be carried out between August 2012 and July 2015, following the logical framework agreed in the SDC Project Document (SDC ProDoc). The ClimAndes consortium involved as executors the Swiss Federal Office of Meteorology and Climatology (MeteoSwiss), along with the other two MeteoSwiss sub-contracted organisations: namely, University of Bern (UniBe) and Meteodat GmbH (Meteodat); the National Meteorology and Hydrology Service of Peru (SENAMHI) and the Universidad Nacional Agraria La Molina (UNALM), acting as coordinator the WMO and its Project Coordination Unit Office for Resource Mobilization and Partnerships, the WMO/Regional Office for the Americas, the WMO/Development and Regional Activities Department and the WMO/Education and Training Office. The two main expected outcomes from ClimAndes are:

1) Reinforcing the WMO/Regional Training Centre (RTC) at the UNALM as a reference in the Andean Region to train and prepare staff specialised in Meteorology and Climatology, and

2) Ensuring an adequate use of the climatic information by Peruvian decision makers and end-users as envisaged by the GFCS.

On February 2015 a Mandate Type B was signed between the SDC in Bern (Switzerland) and Fundació URV (Univeristy Rovira i Virgili Foundation) in Tarragona (Spain) for the External Evaluation of the Project ClimAndes Phase 1 (Contract number: 81031720; Project number: 7F-08453.01.02). The objective of the contract is to undertake an External Evaluation of the Project ClimAndes on its Phase 1, in accordance with the Terms of Reference (ToR) agreed, in

order to provide to the contractor and participating organisations an independent evaluation about relevance, effectiveness, efficiency, impact and sustainability of the project on its Phase 1, formulate and justify recommendations for improving efficiency and impact of ClimAndes on its Phase 2 and elaborate and deliver communication material, based on the findings and lessons learnt under ClimAndes Phase 1.

After carrying out the activities committed in the ToR of the external evaluation, the evaluators were able to recognise the strengths and weaknesses of the ClimAndes deployment on its phase 1, as well as its threats and opportunities to ensure the end goals of the project are sustainable and durable into the future; enabling, therefore, to identify these areas of improvement to be addressed in the second phase of the project and define a set of recommendations that will be provided in this document.

The structure of this document is as follows: first, in section 2 we provide the national, regional and international context of ClimAndes, while in section 3 are addressed the strengths, weaknesses, opportunities and threats of the first phase of the project, using a SWOT analysis to identify and list them. In section 4, the lessons learnt from the deployment of the ClimAndes' Phase 1 are provided; while in the last section 5, the recommendations and vision for ClimAndes Phase 2 are discussed.

2. General observation of the context (international – regional – national)

The preparation and implementation of ClimAndes has occurred in a favourable international, regional and national context. This positive context is driven by the expectances and requirements of enhanced climate products and services set since the mid-1990s by the successive IPCC reports, but most important, set since the establishment of the GFCS in 2009 by the WMO/World Climate Conference-3. The report of the High Level Task Force of Independent Advisors for the establishment of the GFCS highlights the role of international cooperation in developing human, infrastructural, procedural and institutional capacities, especially in those services which have not attained full or advanced capabilities and are at below or at the level of basic capacities or at the level of essential capacities.

The Swiss cooperation, through SCD/COSUDE, has a long lasting tradition of more than 50 years of supporting the socioeconomic development of Peru. In this context, under the influence of the GFCS and the umbrella of the WMO, SDC has engaged in ClimAndes to foster the development of climate services (CCSS) in the Andean region. The link between the Swiss and Peruvian institutions does not only depart from the will of the donor country to contribute to the Peruvian development, but it is also grounded in the context of similar topographies and complex terrain found at the Alpine and Andean areas which respectively characterise Swiss and Peru. In this regard, despite of the large differences in socioeconomic systems, geography unites both countries and facilitates the twining activities between the Swiss and Peruvian partners, pursuing to solve similar technical problems in the CCSS preparation, such as, among others, the difficulties to homogenise climate time-series in complex terrains, for which the Swiss experience will be vital to address the homogenisation issues related to both the Andean complex terrain and a data sparse spatial coverage in Peru, along with the implementation of homogenisation routines in operational mode at SENAMHI.

The opportunity of ClimAndes to enhance the Peru, and by extension the Andean region, capability to produce and use of CCSS is based on the fact that similar issues are faced in terms of capacitation needs, generation of CCSS, delivery and involvement of the users and policymakers. The existing relationships amid countries are boosted by a common language and by the existence of bilateral agreements between the Andean countries and SENAMHI and the promotion of joint projects expected from the WMO Office for the Americas. The

reinforcement of the RTC/UNALM and the training opportunities arising from ClimAndes and the enhanced expertise of SENAMHI – if adequately promoted by the regional offices of WMO and SDC – puts the Andean region in a favourable situation to improve their capacity to deliver and take advantage of high quality CCSS.

In Peru, ClimAndes arrives briefly after SENAMHI has experienced important governance changes. The demilitarization of the institution has been accompanied by its inclusion as part of the Environment Ministry. SENAMHI's current management team is highly dynamic and strongly committed with taking the successful steps towards fulfilling the mission of "providing timely and reliable products and meteorological, hydrological and climatic services". This ambitious goal requires not only the effort of the institution, but a close relation with the academia and other training institutions, to ensure high level and timely capacitation. In the context of ClimAndes and its national, regional and international projection, SENAHMI and RTC/UNALM are not only paving the way to fulfil SENAMHI's mission, but also profiling themselves as key national and regional actors.

ClimAndes lifetime has seen the development of COP-20 in Lima. This high profile international meeting contributed to raise even more the popular awareness of the impact of weather and climate on every day's life in a country where the effects of climate change and modes of climate variability as well as of extreme events is well understood and suffered. In the context of ClimAndes, and enlightened by the increased profile of SENAMHI and UNALM, there is an opportunity to link this popular perception to policy and action. This must be done by demonstrating and communicating the benefits of timely and high quality climate products and services tailored to the needs of the different sectors of activity and the urban and rural areas of Peru, since only fact-proven benefits through the provision of reliable CCSS will fuel the political support for their elaboration.

In summary, as stated at the introduction of this section, the international, regional and national context in which ClimAndes Phase 1 has developed and the context in which Phase 2 would develop is extremely favourable to ensure a successful project if all the institutions involved contribute as expected.

3. Identify strengths, weaknesses, opportunities, and threats (SWOT Analysis) of the project

The external evaluation of the deployment of ClimAndes on its first phase has identified a number of strengths, weaknesses, opportunities and threats that are discussed in this section and provided by means of a SWOT table provided next:

SWOT analysis results providing internal and external strengths, weaknesses, opportunities and threats for the first phase of ClimAndes

SWOT Analysis	Helpful	Harmful
Internal	*Strengths:* • Potential of ClimAndes to be used as template for GFCS projects globally, given its comprehensive approach to ensure the production and provision of timely CCSS • Enhanced Peruvian political	*Weaknesses:* • Deficient project management and coordination activities within and between the partners by the main Peruvian and Swiss project management • Constraints for the Peruvian beneficiaries imposed by the rigid

	awareness of the need to respond and adapt to climate change impacts • ClimAndes understood by the Peruvian beneficiaries as useful instrument to support the elaboration/provision of CCSS, • Reinforcement of RTC/UNALM as a regional education and training facility that is attracting local and international students and progressing towards consolidation • UNALM has identified the need to adapt the educational curriculum as a consequence of the RTC and as a necessity for its consolidation • Enhanced RTC role for providing tailored capacity development activities for CCSS elaboration, supported by SENAMHI and the e-learning modules provided by ClimAndes to train either the trainers to fulfil its mission or the personnel of the Andean NMHS • A bettered understanding of the RTC and SENAMHI on the need to look for internal and external support to sustain CCSS production into the future • Readiness of the ClimAndes consortium to identify weaknesses and address them in the framework of the project by adding new actions within the other envisaged actions • Improved scientific, technical, technological and institutional capabilities at SENAMHI to elaborate climate products and CCSS through the integration of the know-how and tools gained in an operational basis • SENAMHI reinforcement of the activities on data rescue, data quality and data homogenisation to support the elaboration of climate monitoring and prediction products and services • An enhanced knowledge of decision makers and end users needs and requirements for CCSS	political-administrative regulations in force in Peru, what increases the administrative complexity to undertake the planned actions • Lack of long-term vision on the role of the Peruvian beneficiaries as references for training and CCSS provision • Generally poor indicators to measure progress and results of the RTC educational and training activities • Staffing problems, especially at UNALM and, to a less extent, at SENAMHI, for impelling the research component and provide CCSS, respectively • Lack of immediacy in the application of the curriculum changes and in the absorption of e-learning modules into the official UNALM program • No inclusion of specific climatological competencies in the adaptation of the curriculum of Meteorology • Language and proprietary software barriers for a wider use of the e-learning modules • Absence of a plan to update, support and good management of the e-learning modules • Available training does not fully capacitate in the provision of CCSS • Data availability and transmission difficulties for Nowcasting and Hydrometeorological warnings • Infrastructural difficulties for the provision of climate services • Limited implementation of pilot CCSS in Cusco and Junin to use as a case study to show the benefits of using CCSS • Weak plan and activities to engage policy makers at different political levels to further support and promote CCSS • Scarce visibility of the CCSS dissemination portal

	in the two pilot areas • A bettered envisaged strategy to communicate and involve stakeholders and end-users in the usage and relevance of CCSS • An improved SENAMHI visibility as reliable provider of CCSS among Peruvian governmental bodies • Availability of an exploratory CCSS visualisation portal	
External	*Opportunities:* • A global context favouring the provision of CCSS and the climate agenda • Swiss and international partners seeing ClimAndes as a worthy supporting project • Regional and national contexts in the Andes also favours ClimAndes • Will of the Swiss cooperation to continue funding ClimAndes • International funding opportunities to further impel the CCSS market in the Andean region • Existence of a regional market of potential students of Meteorology and Climatology and NMHS staff to attract by the RTC • ClimAndes impact among Andean countries and NMHS gained thanks to the capacitation activities carried out • Enhanced regional perception of SENAMHI not only as NMHS but also as reliable CCSS provider • The climatic characteristics of the region have a high impact in the socioeconomic system, which allows to demonstrate that CCSS are not an expense, but an investment	*Threats:* • International, regional and national institutions pushing back the climate agenda (low risk) • Eventual end of external funding • Unsustainability of several activities without external funding • Potential competence with other South America RTC and RCCs to attract Meteorology and Climatology students and NMHS staff to be trained • Regional politics interfering with the flux of students to RTC/UNALM • Poor involvement of WMO to communicate ClimAndes' achievements and use the project as a case-study to show benefits and challenges that the implementation of a complete CCSS facility can face amid other regions and the GFCS communities • Lack of effective involvement of stakeholders and policy-makers at the end of Phase 1

The SWOT internal and external analysis of ClimAndes on its first phase shows many helpful (harmful) characteristics that the SWOT matrix collects as strengths and opportunities (weaknesses and threats). Main internal strengths are related to an enhanced educational and training capabilities at the WMO/RTC and SENAMHI institutional capabilities to provide reliable CCSS enabled by the activities undertaken, while other external strengths point to the availability of external resources to continue with ClimAndes activities and an improved regional visibility of the project and the recognition of SENAMHI as a reliable CCSS provider. All

this highlighting the opportunity and benefits brought by the implementation of an integral project that takes into account all the GFCS components and pillars over a region in need of CCSS to reduce the costs and negative impacts of climate variability and climate change determine over the vulnerable Andean socio-ecosystems.

On the contrary, the SWOT analysis also shows main weaknesses and threats faced, both internally and externally, by the project on its first phase. These can be summarised as follows: a) a poor project management and coordination practices; b) lack of vision to further impel ClimAndes objectives beyond the project among potentially interested stakeholders; c) low involvement of relevant policy-makers to further support and sustain ClimAndes end-goals in Peru; d) currently limited specificity of the RTC to educate and train in climatological topics and in the production of robust CCSS; e) insufficient WMO efforts to worldwide disseminate ClimAndes an use its results as template to export to other regions, which has been covered recently by the WMO efforts for echoing the ClimAndes value in the framework of the its Congress-17 and points to the readiness of the coordinator to address and fix the issues identified; and f) current difficulties in fast data exchange to support forecasting CCSS.

4. Major lessons learnt in ClimAndes Phase 1

Through the analysis and study of ClimAndes activities and results, a few lessons can be extracted. First of all, it is necessary to note that ClimAndes is a complex project involving different countries and organisations of very different nature. ClimAndes implementation is conditioned by this fact. ClimAndes includes an institution from the United Nations (UN) system and partners from two different country realities. These organisations are different not only because their different geographic origin, but also because their distinct nature and purposes: academic institutions (UNALM, UniBe), NMHSs (SENAMHI, MteoSwiss), governmental bodies (SDC) and international agencies (WMO). This institutional and geographical diversity can introduce difficulties when it comes to planning and coordination, which can be easily solved by making more efficient communication among the ClimAndes participant organisations without losing the required track of advances through further delimiting responsibilities and relax the timing between periodic internal evaluation activities, while ensuring fluid exchange of information via a more effective project management. The coordination and planning mechanisms, to be effective, must take into account the asynchronies that may arise from this diversity.

An example of the asynchronies described in the previous paragraph is the lengthy and prolix process to internally evaluate and approve the intermediate evaluation reports by all the partners. Another asynchrony is the lengthy process required at UNALM to consolidate the modifications made through ClimAndes activities to the curriculum of the Meteorology degree and to consolidate the ClimAndes e-learning modules into official credit-granting courses. The goal of ensuring competent meteorologists in terms of WMO's Basic Instruction Package for Meteorologists (BIP-M) will be ensured at mid/long term, but the first generation of students taught with the new program will start their studies after the completion of ClimAndes Phase 1 and, perhaps, even after the completion of an eventual ClimAndes Phase 2. This has to be taken into account when planning the expected results.

Yet a very important finding through this evaluation is the lack of singularity of Climatology as science, which shares a good part of its body of knowledge, techniques and even objectives with Meteorology, but has particular demands. In detail, creating competent meteorologists does not ensure that these professionals are fully capacitated to provide climate products and services. Thus, more attention should be paid to the specific development of a curriculum intended to create competent professionals for the provision of climate services through

identifying better climatological formative needs, planning an attractive programme of tailored training and more complete and better supported e-learning modules.

In any project, progress monitoring is a key element to ensure timely accomplishment of the objectives and delivery of the expected results. Another lesson learnt from the evaluation of ClimAndes Phase 1 is that, to ensure the effectiveness of monitoring and foster its capability to readdress execution problems, progress reports and other planning and coordination activities should be concluded in a reasonable time span - shorter than the average time taken under ClimAndes Phase 1 -, and should be made available to the entire consortium without delays by project managers. When progress is evaluated through indicators, it is necessary to ensure that these indicators are simple, unequivocal and measurable. As a quick example, the number of students, which took a course, is simple and measurable, but it is not unequivocal, as it does not give any information on the knowledge gained and professional competencies achieved. Thus, complementary indicators should measure what benefits and competencies the students achieved from the activity and the level of success of the enrolled students in the Meteorology Degree, among others.

The evaluation pointed out that some activities – even if they got very successful results – faced planning difficulties. When planning training or outreaching activities, it is very important to pay attention to logistic and technical details. The return of the investment made, should be secured by identifying and engaging well in advance the attendance of all the key participants/sectors of activity/stakeholders to whom the activity is destined. For similar reasons, it is necessary that the technical requirements of the activity are met before its start: capacity of the venue, hardware and software, internet connection, data availability and access and in general any secure other material/resource necessary to guarantee optimal results.

The users and trainers evaluation of some activities highlighted language barrier problems in some of the activities. The most spoken language in Peru and in the Andean countries is Spanish. These countries constitute the target of ClimAndes and are the natural students' recruitment area of the RTC/UNALM. Working language at SENMHI and other NMHS in the regions is also Spanish, and Spanish is, at least, better understood than English by local communities. Although English knowledge and its usage for educational, operational and scientific purposes is important in projecting the activities of the region towards the international community, the training activities addressed to regional students/trainees from the region are better taught and better assimilated if the vehicular language is Spanish. The negative effect of the fact that climatological modules were prepared and taught in English can be seen in the evaluation given by both their facilitators and the trainees. This claim is not at all against fostering the improvement of English knowledge, but it should be separated from professional training.

It is opportune to introduce a consideration – arising not only from the evaluation of ClimAndes, but also from the evaluators' experience – about the volatility of training. Workshops, training activities, mentoring relationships and other forms of capacitation do not develop permanent capacity in an institution unless they are integrated into a policy of consolidation and application of the acquired knowledge. Unfortunately, too often the personnel of the NMHSs and other institutions providing and or using climate products have many different roles and duties. The learning activity developed one week is too often forgotten the next, due to the immediate necessity of devoting time to other pending tasks. The knowledge acquired through ClimAndes Phase 1 in data quality issues, nowcasting, hydrometeorological warnings will not result in developed institutional capacities if the trainees do not have the chance to reinforce their knowledge with further mentoring and with training by doing. Although this is quite demanding from the trainers' side, ideally the educator's compromise with the trainees should go further beyond the development of the

event and be available to answer questions in remote and – if budget allows – the institutions should seek refresh/update activities. The need of engaging in lifelong training processes should not be – though – and obstacle to immediately start with the development of climate products, made available to the society. Lifelong training will progressively consolidate them. Equally important is to ensure that these new or improved products are subject to quality management processes and integrated into the routinely procedures of the institution in an operational mode. This will help to avoid duplications and avoid lost efforts. In this regard, the directive body of SENAMHI has interiorised the need for operationally implementing the best practices and techniques learnt during training activities, will that should continue during and beyond of ClimAndes Phase 2.

Last consideration can be synthetized in the fact that ClimAndes needs not only to reach its objectives and expected results, but also explain them to society and raise awareness on why the tax payers' money put into enhancing CCSS is not an expense, but an investment. To increase the visibility of ClimAndes activities among stakeholders is very important. This should be done not only in the Andean region, but also in Switzerland, as a demonstration to the donor country's population on the good investment made. In the Andean region, the necessity to increase visibility has not only a propagandistic goal, but also a practical one. A high profile and a clear identification of ClimAndes activities as actions that can save money, infrastructures, properties and lives, will result in an easier engagement of the stakeholders. As mentioned at the beginning of this section, ClimAndes has a complex consortium, distributed inside and outside the target region. The Regional Office for the Americas of WMO, due to its connections inside and outside the region, should play a key role in raising the visibility of the project, as recently done by taking advantage of the WMO seventeenth congress as a framework to disseminate ClimAndes value. SENAMHI should play a key role in explaining to the local communities through adapted – in content and language – outreaching activities.

5. Ideas/Recommendations for ClimAndes Phase 2 ("Vision")

From the external evaluation carried out and the lessons learnt from the deployment of ClimAndes on its first phase, a number of recommendations can be done to ensure the correction of the weaknesses and internal and external threats identified that menace the impact and sustainability of ClimAndes, either during its second phase or beyond. The order of the recommendations does not imply prioritisation.

First, orientate the second phase of ClimAndes on assessing and proving the socio-economic benefits of implementing opportune climate and water services by using the expertise and experience gained under ClimAndes phase 1 and fostering its utilisation as exemplary case-study among the GFCS communities to support a more effective global framework.

Second, it is necessary to ensure a more flexible and efficient coordination structure within the ClimAndes partners – the Monitoring Committee – to ensure the required fluid communications among the partners, the identification of project issues, the implementation of the required measures to address them and, above all, a more rapid approval of the internal evaluation reports.

Third, improving the project managing practices by the two main Peruvian and Swiss beneficiaries, in order to acquire the qualitative vision required to ensure the RTC becomes a regional reference centre in the education and training on CCSS and the consolidation of the SENAMHI role as reliable CCSS provider, in the case of SENAMHI, and a better use of WMO and GFCS potentialities to better use ClimAndes and communicate its achievements and challenges worldwide, in the case of the main Swiss beneficiary.

Fourth, inclusion of the internal evaluation process as an important component of the project management and unlink the thematic and administrative parts of ClimAndes.

Fifth, to devote more ClimAndes efforts in seeking further national and international financial support and opportunities to consolidate the RTC and the SENAMHI scientific, technic and technological capabilities to deliver CCSS.

Sixth, making a better use of the internal Peruvian policies, including educational policy, to promote either knowledge or actions to socially better understand, respond and adapt to climate change impacts.

Seventh, improving the UNALM role of following up the RTC achievements and support it better, in order to ensure its sustainability as renowned regional reference training centre within the project timeframe and, particularly, beyond ClimAndes.

Eighth, to make a better use of the WMO Regional Association III opportunities – calls for scholarships and internships – to attract external students and personnel to be trained at the RTC.

Ninth, ensuring updates, scientific support, wider use and increased regional visibility and accessibility to the provided e-learning modules and finalise the modules committed in the SDC ProDoc by involving UniBe to facilitate them.

Tenth, reinforcing the acquired new capabilities for producing climate monitoring and forecasting products by introducing tailored capacity development activities in the topics of high-quality climate data development, hydrological modelling, nowcasting and seasonal prediction technics intended to capacity the SENAMHI personnel at its central headquarters and at its 13 regional centres.

Eleventh, addressing the deficiencies found in the required fast data exchange and transmission to facilitate nowcasting and hydrometeorological warnings.

Twelfth, reinforcing the integration in operational mode of the climate time-series quality controls and homogenisation procedures learnt and partially executed to the climatic records of both pilot areas and extend them to the unexamined series existing at the SENAMHI databank for other Peruvian regions (e.g. Puno).

Thirteenth, consolidating the data rescue procedures already implemented thanks to SENAMHI own resources to add undigitised historical and present observations into the databank to improve the basic input to produce CCSS over the whole country.

Fourteenth, enhanced plans to reach relevant Peruvian stakeholders – policy and decision makers and end-users – of other Peruvian regions (e.g. Puno), in order to better communicate the socio-economic benefits of implementing CCSS and involve them in the process.

And fifteenth, to finish the implementation of an on-line friendly, easily accessible, more complete and interactive climate data visualisation portal that supports the provision of CCSS and its dissemination among the interested stakeholders.

Comments and recommendations from Manola Brunet, main external evaluator of the ClimAndes phase 1, on the proposal for phase 2 of ClimAndes discussed by the Monitoring Committee on the 28th May, 2015 (Geneva meeting)

By Manola Brunet*, main external evaluator of the ClimAndes project on its phase 1

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Tarragona, June 2015

The new and confidential - at this stage - proposal for continuation in a second phase of the ClimAndes project elaborated and discussed in the ClimAndes' Monitoring Committee meeting held in Geneva, organised as a side event of the World Meteorological Organisation (WMO) Seventeenth Congress (Geneva, 28 May 2015) was provided to this external reviewer for comments. This document, therefore, provides the views and suggestions of the external evaluator for a better definition and implementation of the end goal and outcomes envisaged in the draft proposal of ClimAndes for its phase 2.

The proposal for a second phase of ClimAndes has as end goal and global target of the project a "*more effective global framework or climate services and user-tailored climate services for the Andean region improve socio-economic benefits for the agricultural sector and for society at large",* and three main outcomes are envisaged:

1. User-tailored climate services for the agricultural sector improve socio-economic benefits for Peru and the Andean region

2. Climatology-related professionals and students are able to develop high-quality climate services for Peru and the Andean region

3. Political stakeholders are increasingly aware of the socio-economic benefits (SEB) of SENAMHI's sector-specific climate services and public policy making is influenced in this way

With the target group of the phase 2 being: *Political decision-makers in Peru and Andes, professional weather forecasters in Agriculture sector in Andean Region, students in the field of meteorology and climatology of WMO Member States in Region III*.

The new strategic orientation of ClimAndes phase 2 is intended at ensuring a) the socioeconomic benefits of weather climate and water services, b) contributing to the Global Framework for Climate Services (GFCS) by bringing ClimAndes experience for a more effective global framework, and c) ensuring progress in climate services value perception for action.

Either by its overall goal or by the envisaged three outcomes and its two additional add-on, the new proposal, according to this evaluator, integrates and articulates well and satisfactorily both the new actions and activities to be carried to successfully attain the global goal and the shortcomings and weaknesses identified in the external evaluation report and the recommendations made by the external evaluators. In this regard, the new strategic orientation seeks to reinforce and consolidate the achievements attained by the beneficiaries and partners in the first phase and ensure the end goal of ClimAndes is attained by introducing new specific objectives whilst ensuring consolidation of the old objectives.

Therefore, this evaluator thinks the expected outcomes designed for the second phase of ClimAndes are highly relevant, effective and useful for the donor and beneficiaries in order to attain the end goal of the 2nd phase.

In this regard, the focus of the envisaged outcome 1 on making available innovative tools for climate services, including the precipitation and drought climatologies, the

prototype for seasonal prediction for the Andes or the drought and precipitation information platform orientated to the agricultural sector are highly relevant.

Only concern lies in currently displayed outcome indicators to measure progress of Outcome 1, since the three indicators shown in the Logical Framework Table to measure progress are dependent of the successful deployment of the new activities envisaged, which seems logical to be attained by the end of the 2nd phase and, therefore, making difficult their application in intermediate internal evaluation stages to measure progress and address shortcomings. In addition, they seem weak and ambiguous indicators to measure progress, as they are just based in the number of farm families and economic farm units implementing and having access to climate services, along with the degree of farm families' satisfaction. New simple but measurable and unequivocal indicators should be envisaged to measure the intermediate progress (e.g. some indicators measuring the number and type of actions carried out to foster the usage of climate services among farm families and units and the number of target users involved, independently of having implemented or not the proposed climate services could be desirable to measure the intermediate progress), along with more unequivocal indicators to assess progress in this area (e.g. including some indicator measuring the saved costs of the implemented climate services could be applied towards the end of the project).

Similarly for Outcome 2, the specific objectives seem to be well designed and aligned to reinforce and consolidate the training centre located at UNALM and the emphasis placed in promoting the employability of the professionals and students trained in the WMO/RTC and the re-orientation of the e-learning modules focusing on the provision of climate services, along with the new courses embracing the socio-economic benefits of climate services implementation seem to be highly adequate and relevant.

However, efforts have to be additionally placed on the tailored capacity development activities that have been crucial to reach successful results in the first phase, as they have been key formative elements to ensure know-how in several methods involved in the generation of high-quality climate services. The e-learning modules alone, although they are climate services-oriented, won't be able to ensure the availability of well-trained and skilled professionals, since this target requires specific capacity

development activities to consolidate past training achievements and address new ones, which makes highly recommendable keeping the specific training activities as another instrument to reinforce the production and provision of climate services. In addition, the currently envisaged indicators, as in the former outcome, are weak and ambiguous, since to measure progress based on the number of national and regional students and professionals is simple and measurable, but it isn't unequivocal. Other indicators measuring the employability of the RTC students and professionals and the degree of success and satisfaction of the students and trainees should be envisaged.

Also for the Outcome 3 and its add-on activities seem to be highly relevant and well designed to making aware policy-makers, decision makers and end-users of the socioeconomic benefits of the implementation of climate services. In this regard, it seems feasible that the specific objectives designed for a) raising awareness among public managers of the socioeconomic benefits of the climate services, b) the identification of the public managers targeted and the promotion of public policies on food security, and c) the development of a SEB case-study to estimate the potential value of climate services for the agricultural sector seem to be also highly relevant. This good impression is also extendible to the inclusion of the two add-on outputs envisaged, since they can add a better knowledge on the potential market for climate services of other climate-sensitive sectors that will be very useful beyond ClimAndes and the articulation between science-based climate services and the traditional indigenous knowledge will provide key insights on the usefulness and limitation of the traditional knowledge and will increase the acceptance of ClimAndes among the targeted end-users.

From the add-ons cross-cutting activities assessment, while seeking a strategic collaboration partnership is perceived as a highly relevant and useful activity that should be promoted, the production of a ClimAndes promotion movie hung from partners and project websites is not perceived as so relevant as the first cross-cutting add-on, although I understand the interest and value of disseminating the ClimAndes messages and benefits. Therefore, I recommend to place first the efforts on those very relevant activities and if the budget permits, to go for the production of such a movie.

With regard to the stakeholders' assessment to ensure synergies with other national and regional projects and South America Regional Climate Centres (RCC) to ensure results dissemination among NMHS worldwide, in addition to the CIIFEN RCC, it is advisable to also involve the CRC-SAS (Regional Climate Centre for southern South America in Argentina) to coordinate efforts and avoid activities duplication. There is also very important to establish synergies with the other two RTCs in South America - the Brazilian and Argentinian RTCs - to join efforts in formal and informal education and avoid duplicating capacity development activities. I think the envisaged strategic collaboration partnership should identify ClimAndes-relevant national and regional projects and seek synergies with other cooperation international agencies (e.g. World Bank and other UN and international agencies) to avoid duplication by establishing communication links, which will minimise the risk of overlapping with other projects' proposed activities. This coordination should be fostered by the ClimAndes Implementing Unit under the WMO coordination, along with the WMO/Regional Office for the Americas, since the latter have the contacts and international links to ensure the required coordination among projects and RCCs and RTCs.

Finally and related to the proposal for Monitoring and Steering ClimAndes, some caveats has to be made. The semi-annual reports to be elaborated by SENAMHI and MeteoSwiss suppose a vast paperwork that consumes time and resources to see approved the reports by all the beneficiaries and donor, as already seen on its first phase. These semi-annual reports and the lengthy process that takes their approval don't seem to be the most efficient way to assess success and address shortcomings, particularly if this management activity is not included nor funded by the project budget. In addition, it seems at least redundant and contradictory establishing the timing for providing the annual progress reports by SENAMHI only and don't do the same for the semi-annual reports, besides of being unclear what value these annual reports will add on to the semi-annual reports. I think a more flexible and informal process, mainly involving the actors implied plus the donor, as required, and not to the whole consortium will make more efficient the semi-annual internal monitoring, while the annual reports could be approved by the whole consortium. Monitoring progress has to be ensured effectively and efficiently without overloading and duplicating the

monitoring activities, while the steering committee has to ensure this follow up do not add unnecessary and redundant costs to the project in terms of financial and human resources.