FINNISH METEOROLOGICAL INSTITUTE

IDEAM Instituto de Hidrología, Meteorología y Estudios Ambientales

ICI PROJECT DOCUMENT

Building capacity at IDEAM to reduce harmful impacts due to changing climate and extreme weather in Colombia

FMI-IDEAM ("COFIMET")

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Submitted by the Finnish Meteorological Institute, FMI
In cooperation with
the Institute of Hydrology,
Meteorology and Environmental Studies - IDEAM

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[1] The MoU document has been presented to IDEAM, but will be signed and submitted later.

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1. Background and justification

1.1 Background

Current Finnish Development Policy has set a key objective of eradication of poverty and promotion of sustainable development and has a priority for climate and environment issues. The policy emphasizes institutional capacity building between Finnish and developing country partners. This project, 'Building capacity at IDEAM to reduce harmful impacts due to changing climate and extreme weather in Colombia' (COFI), addresses issues of climate change adaptation, sustainable development and supports peace-building by promoting cooperation with the Institute of Meteorology, Hydrology and Environment of Colombia (IDEAM).

Preliminary discussions between FMI and the meteorological services in the Andean countries Bolivia, Colombia, Ecuador and Peru) were initiated already in 2008 after the visit of the General Director from the Andean Commission (CAN) to Finland and FMI during summer 2008.

As a spin-off of the visit to Finland and FMI, CAN organized in April 2009 a regional workshop in Lima regarding the improvement of the meteorological capacities for the prediction of climate and early warnings in relation to climate change (Taller Subregional "Oportunidades para fortalecimiento de capacidades para la predicción climática y alerta temprana frente al cambio climático")

For the regional workshop CAN invited representatives from the meteorological services from the 4 Andean countries Bolivia, Colombia, Ecuador and Peru together with representatives from the Finnish Embassy, FMI and Vaisala.

During the workshop the situation and development needs in the region and the countries were presented. The Finnish Embassy introduced the ICI capacity building concept to the local meteorological institutes, which arouse the interest of all local institutes in establishing contacts with FMI.

After the CAN workshop in April 2009, the concrete ICI project discussions with Senamhi in Peru were initiated and the FINAMPO ICI project started in September 2009. The discussions with the other countries were continued, but not processed towards immediate project starts.

The process towards closer cooperation with the other Andean countries took a concrete step forward during a regional WMO meeting held in Bogota in September 2010, where also the representative from the other Andean countries Bolivia, Ecuador and Peru participated. During a side event, the general directors of the four Andean countries together with FMI discussed the possibility to receive support for the creation of a regional early warning system, where experience from Europe and Finland could be applied.

Since the regional workshop and side event in Bogota in September 2010 FMI has visited IDEAM in Bogota twice, and been able to get a thorough picture of the present situation and

needs for improvements which could be carried out through an ICI project and capacity building activities and knowledge provided by FMI.

During the planning missions the IDEAM provided information on its strategic needs, specific areas of capacity building were identified and prioritized and, as a result, the Project Document was developed.

- For the "COFIMET" ICI project IDEAM has managed to allocate 6 experienced and skilled persons who will lead and coordinate the project activities within IDEAM and act as counter parts to FMI´s key experts. IDEAM´s project team has knowledge covering all necessary areas such as meteorology, observation technology, ITC and computer systems, Numerical Weather Prediction modeling and weather forecasting,

Although IDEAM has other ongoing development projects, it can be seen that the COFIMET ICI project perfectly fits as a complement to the other projects with more emphasis on concrete technical support, problems solving and hands-on training. It can also be considered as an advantage that IDEAM has experience in managing and cooperating in similar development projects.

Due to the similarity of capacity building needs in the national meteorological services of Colombia and Ecuador, we have prepared two rather similar ICI projects, to be run in parallel. To maximize the synergy and to enhance interaction and cooperation between the two neighboring countries, the same experts from FMI will operate in both projects, as well as the training during the study tours in Finland will be organized simultaneously to the representatives from IDEAM, Colombia and INAMHI, Ecuador.

1.2 Strategies and needs of IDEAM

- The Hydrological, Meteorological and Environmental Studies Institute (IDEAM[2]), founded in 1993-1995, is a public establishment within the Ministry of Environment and Sustainable Development (MADS[3]) giving technical and scientific support to various government agencies and the economic sectors.

The key mission of IDEAM is to act as the technical and scientific excellence of the Colombian Environment Information System (SIAC[4]) for decision making on the sustainable use of natural resources and an authority in the field of environmental data generation and collection, forecasts and warnings'. Accordingly, the mission of IDEAM is to generate information and knowledge to advise the government on sustainable use of natural resources, as well as to make public forecasts and alerts about events that may generate hydro-meteorological disasters.

Informing the government and the general public of the likely risks of natural disasters and issuing alerts and warnings on severe weather, is one of the key tasks of IDEAM constantly growing in importance as the societies have become more vulnerable. Statistics and natural disasters in North, Central and South America indicate that the majority of events, casualties and economic losses are related to meteorological-, hydrological- and climate related

[2] Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia (IDEAM)
[3] Ministerio de Ambiente y Desarollo Sostenible (MADS)
[4] Sistema de Información Ambiental de Colombia (SIAC)

hazards. Strengthening of the early warning services is necessary because of the climate change is expected to make the societies even more vulnerable to hydro-meteorological extreme phenomena such as strong winds, costal marine conditions, tropical cyclones, heavy rain/flood and heat waves.

Recent workshops on disaster risk assessment and early warning systems have concluded that challenges for better preparedness are related to legislative, financial, institutional, technical and operational aspects both at national and local levels. Therefore capacity building is required in all components of the early warning systems and preparedness process; E.g. in hazard detection, monitoring and forecasting; incorporation of emergency planning and warnings; deliver of authoritative warnings and in emergency planning and preparedness[5],

The main product of IDEAM is strategic information continuously provided and incorporated as an added value on the gross domestic product of the country and its assimilation by the productive sector and society. Examples of sectors of the society benefiting of these services and support include users of biophysical natural resources of the country, agencies mitigating the risk form natural hazards, and the general public.

To run its activities the IDEAM had in 2010 an official budget of an amount equivalent to US$18.7 million (national and own resources), of which US$14.6 million corresponded to staff costs and operational costs The remaining amount (US$4.3 million) corresponded to investments. For the 2011 it is expected that the IDEAM budget will be similar with an increase just like the inflation rate.

IDEAM has a total of 471 employees of which 35% are professionals, 50% technical level and 15% assistance level staff distributed in 11 operational areas of the country. Academic training of specialists emphasizes the degree of masters and doctors in social, environmental, physical and administrative sciences, among others.

It is recognized that recently an important part of trained personnel has been retired of the service resulting in difficulties to train new and existing staff. For example, in the 1970's around 30 Colombians obtained a degree in meteorology with the support of the World Meteorological Organization (WMO). Unfortunately only seven (7) of these 30 professionals are still at the Institute and four (4) will retire soon.

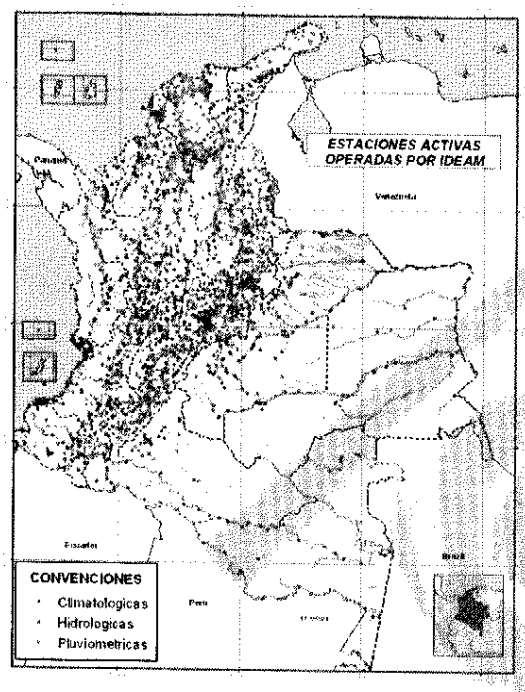
One of the greatest challenges regarding labor force capacity is to combine the ageing of the labor force, acquainted with long term traditional methods of working, to the needs to make technological/methodological leaps, e.g. from time consuming manual preparation of products to more efficient semi-automated products assisted by IT technology. Making these leaps of development smooth and sustaining will require a systematic step by step approach and demonstration. In the case of this project the selected staff of IDEAM will visit FMI in Finland to benchmark new methodologies and technologies at environments where they have been fully implemented and proven useful.

With the proposed project activities, three priority areas of capacity building are addressed, namely the (1) handling of observation data, (2) building readiness to utilize weather radar

[5] WMO 2010: Final report: Training Workshop on Multi-Hazard early Warning Systems with focus on InstitutionalPartnerships and Coordination *March 22-25.2010 San Jose Costa Rica, http://wmo.Int/pages/prog/drr/events/MHEWSCostaRica/index_en.html*

information and (3) to enhance the capacity to provide weather services, alerts and warnings.

1.2.1 Development of the handling of observation data at IDEAM



To contribute to the official environmental and hydro-meteorological information system of the country (National Environment System, SIAC), IDEAM maintains integrated databases, telecommunications platforms, e.g. a satellite based data retrieval system. Environmental and hydro-meteorological information is collected from a network of approximately 3.000 observation stations. The types of observation networks include 2134 conventional (manual) stations, of which are 1298 pluviometres, 782 hydrological and 500 meteorological stations; in addition there are presently 446 automatic stations of which 230 transmit observation in real time via satellite. These stations are also classified as either hydrological & climatological stations, upper air sounding stations, precipitation alert stations, precipitation and temperature extreme stations, hurricane monitoring sites, mareograph stations and/or agrometeorological stations. IDEAM also performs environmental quality analyses in its own laboratory. The meteorological and hydrological observation methodologies follow the guidelines of WMO and the most commonly required environmental variables are covered.

A comprehensive hydro-meteorological observation network involves a vast amount of information involving metadata and actual observation data. Metadata consists of numerical or descriptive information on methods of how the measurements are performed. It may contain, for example, data on station locations, variables measured, units and instrumentation used, functioning of instruments, calibration factors, sampling frequency and info on the calculation of derived products. For reliability of services and research, the metadata is as valuable as the data itself. Therefore it should be well organized, handled in a systematic way and easily accessible to the user with help of information technology.

The relevant metadata should be updated continuously as changes appear, however keeping the history of changes. This enables users of the observation database to understand and interpret the data. For example the climatologists need metadata to interpret and homogenize long term data series thus enabling a solid basis for studies focusing on climate variability and climate change.

In IDEAM, as well in almost all other meteorological institutes there is a need to improve the metadata storage process.

1.2.2 Building access to weather radar data at IDEAM

IDEAM has also access to remote sensing data from the geostationary and polar orbiting environmental satellites. Weather radars, often operated as a network covering large areas, are commonly used in weather services for severe weather nowcasting (eg. prediction of flash floods, wind gusts, damaging rains/hail storms), aeronautical warnings (Sigmet) and agricultural purposes. Doppler weather radars also produce information on radial wind velocities. This data can be directly assimilated by numerical weather prediction models. The present technology in radars allows also automated identification of the type of objects (e.g. snow, hail, liquid water, non-meteorological objects). A fully operational weather radar network covering the focal geographical areas of economic importance has in most countries proven to be an investment that in return provides many-fold savings to the society.

It is recognized that IDEAM does not presently operate or have access to weather radar data. However, the Civil Aviation Authority (Aerocivil) has newly purchased a modern weather radar manufactured in Finland by the company Vaisala. Aerocivil has indicated that the data from this radar could be available to IDEAM. Aerocivil has planned to purchase seven more radars to be installed in the vicinities of selected airports in Colombia.

1.2.3 Enhancing weather services and issuing of severe weather warnings at IDEAM

The mission of the Office of Forecasts and Warnings (Oficina de Pronósticos y Alertas) is to provide forecasts and warnings to prevent loss of life and to reduce the negative impacts of hydro-meteorological hazards and climate in support of risk management and reduction. The tasks of 7 duty meteorologists are divided according to the types of phenomena followed: meteorology, hydrology, marine weather, geomorphology, forestry, agro-meteorology and special meteorological services. The office operates on work days and during day time hours.

The daily meteorological, hydrological forecasts rely basically on three numerical models run operatively or accessed at IDEAM. The Weather Research and Forecasting Model (WRF) and the MM5 are meso- or micro scale models with a typical horizontal resolution on the order of a few km's and limited to a region of interest of the service; the Global Forecast System (GFS) model is used to monitor the atmospheric development on a global scale. A database SYSDIHM is established to provide access hydro-meteorological observations and numerical forecasts.

The national system for disaster risk assessment and prevention (Sistema Nacional de Prevención y Atención de Desastres-SNPAD) of Colombia is organized by law, by which IDEAM is mentioned as one of the decentralized institutes with given mandates and duties. An internal panel, consisting experts from different departments of IDEAM, is held during morning hours to assess the weather, marine and environmental conditions and to decide on alert levels.

Key products of the unit involve weather bulletins containing weather and climate outlooks, watches and warnings on river floods, flash floods, landslides associated with heavy rain, risk of forest fires, frost, hurricanes, swells and storm surge. This information and specifically the watches and warnings are communicated in order of priority to the president office, risk management directorate, regional and local committees, risk management agencies, civil defense and red cross and is also available on IDEAM's web pages.

The Office of Forecasts and Warnings is lacking methods to integrate and handle the vast amount of environmental information available to IDEAM into one structured working environment. There is clearly a need in IDEAM to have a tool where observational data, satellite data, geographical information and forecasts can be easily laid on top of each other to make assessment of the state and development of environmental conditions. Such a tool, often called as a meteorological workstation (or working environment), would ideally rely of modern information technology allowing the meteorologist/ hydrologist to interfere with the data, compare forecasts from different models and also make online visual demonstrations to other colleagues in assessment meetings.

The integrated working environment would also allow automated processing of data and many products that meteorologists now prepare manually. As a result more time would be available to concentrate on expert assessment, namely the alerts and warnings.

There is also a need in IDEAM to develop a quality monitoring system to systematically monitor the accuracy of numerical forecasts, final products and timeliness of services. This information helps understanding the behavior of the forecast models, gives guidance to the developers and also assists the meteorologist to choose the best model depending on the variable, condition or application. A verification system also lays ground on the credibility of the services from the point of view of the directorate and the customer sector.

At present the services of IDEAM are directed predominantly to the government ministries and agencies, although the basic services and products are also available to the general public via the Internet, radio and TV. With increased efficiency allowed by the working environment IDEAM could also expand its services to different media specialized customers with products and services specialized to their needs.

1.3 Finnish Meteorological Institute (FMI)

The Finnish Meteorological Institute (FMI) is a research and service agency under the Ministry of Transport and Communications. The main objective of the FMI is to provide the Finnish society with the best possible information about the atmosphere above and around Finland, for ensuring public safety relating to atmospheric and airborne hazards and for satisfying requirements for specialized meteorological products.

Vision
The Finnish Meteorological Institute - Cutting-edge expertise in European atmospheric know-how

Mission statement
The Finnish Meteorological Institute produces high-quality observational data and research knowledge about the atmosphere, combining its know-how into services to benefit of mankind and environment. Finnish Meteorological Institute:

- Observes the physical state of the atmosphere, its chemical composition and electromagnetic phenomena;
- Produces information on the past, present and future state of the atmosphere;
- Conducts research of high standard in the fields of meteorology, air quality, space physics, marine research, remote sensing and geomagnetism;

- Carries out competitive commercial activities based on the providing of expert services both in Finland and abroad;
- Takes an active part in national and international cooperation;
- Actively disseminates information about matters related to the atmosphere;
- Forecasts changes and responds quickly to changes in the environment and changing expectations;
- Is an active partner in international cooperation

FMI has expertise from development cooperation and strengthening of national meteorological services in more than 80 countries since the 1980s and a strong commitment to participate in international cooperation and consulting as outlined in its strategy.

FMI has strong expertise and know-how in the subject areas of this project. FMI experts have carried out feasibility studies and studies on impacts of hydro-meteorological services to different socio-economic sectors and achievement of the MDGs in many countries for the Ministry for Foreign Affairs of Finland, World Meteorological Organization (WMO), UN-ISDR, World Bank, etc. FMI has a strong internal training unit with close cooperation in training with the University of Helsinki and also a dedicated communications unit and expertise in the communication of weather and other information to the media, general public and customers.

International consulting projects in more than 80 countries have drawn on skills of the FMI in:

- Management;
- Project management;
- Workshop organization;
- Socio-economic and feasibility studies;
- Data management;
- Communication systems
- Forecasting;
- Numerical weather prediction;
- Automated observation systems;
- Remote sensing;
- Early warning system for natural hazards;

FMI carries out professional development programs in Meteorology and Hydrology for its staff. The results have been very positive and FMI can draw from its experiences in organizing the training courses for IDEAM. FMI has a long history in development cooperation in Latin America

Radar and Space Technology -group at FMI develops methods for the detection of rain, convection and many other atmospheric phenomena with weather radars and lightning location systems. The group is also responsible of the design, implementation and operation of new satellites. Weather radar research is focused on the design of new innovative methods for the detection of several atmospheric phenomena, including hydrometeors, birds and insects based on dual polarization weather radars. Also, new methods are developed especially for the better warning of dangerous weather phenomena like thunderstorms and lightning. The group is cooperating internationally in many scientific projects.

2. The Objective and Purpose of the Cooperation

2.1. Overall Objective

Overall objective is to reduce risk for the loss of human life and property caused by hazardous weather and changing climate in the Colombian society

Indicators of success:

- Reduction of fatalities and loss of properties from weather and climate related natural disasters
- Investment strategies of the Government of Colombia on disaster risk reduction

Sources of verification:

- Reported casualties and economical losses following severe weather in Colombia
- Increase of investment into weather and climate services in Colombia

2.2. Project Purpose

Improved readiness and capacity at IDEAM to manage and produce safety services on extreme natural phenomena for the Colombian society

Indicators of success:

- The knowledge attained through training and demonstration on observation networks, weather radar, product development and customer oriented services are reflected in the development planning of IDEAM.

Sources of verification:

- Strategic and development plans of IDEAM

Adaptation and mitigation to climate change has a high priority in Colombia where especially the probability of droughts and excess rains is expected to increase. The economy of the country is affected substantially on the increase of unfavourable weather. According to the programs of WMO, the advanced use of weather and climate data will help users and decision makers plan and adapt their activities to expected conditions. In this way they may take decisions which reduce risks and optimize socio-economic benefits.

The enhanced use of observation data will enable the gathering, Quality Control (QC) and management, analysis, production and dissemination of the weather products. The weather observations, as well as in future the different radar products, can be used to modernize the public services by using modern distribution channels like internet and mobile phones.

The possibilities to develop both short-term weather warnings (e.g. heavy thunderstorms and heavy rain fall) and medium-range warnings (e.g. increase in water level and floods, periods of extreme weather events, drought etc.) are improved by the new technology. Accurate and timely weather warnings are essential for the protection of life and property of the people and thus for contributing to the poverty reduction.

The agencies are committed to a limited time frame for implementation of the project for two years (beginning of 2012 to end 2013). A progress report will be submitted periodically twice a year. The report will reflect the trend of success.

3. Expected results and Activities

In this project FMI will contribute to the

- Improvement the quality and the use of observation data
- Building access to the use of radar weather data
- Improve the weather services, products, alerts and warnings

3.1 Project Results and Indicators

Result 1: Improved capacity of IDEAM to manage meteorological station networks, archive observational data and monitor/control data quality

This result will be achieved through interactive workshops, study tours, training & support on

- developing and maintaining online documentation on the observation metadata.
- establishing data-base structure, I/O operations and visualization tools to display observation data.
- developing methods for real-time Quality Assurance and Quality Control (QA/QC) of observation data. Assistance in development of methodology and software for on-line monitoring of data quality
- perform calibration of standard meteorological instruments

Indicators:

- Improved control and quality of observation data
- Balance of men and women attending project activities
- New methods/tools adopted to monitor observation data and supportive information

Sources of verification:

- Statistics on data availability
- Project reports
- Workshop reports

Result 2: Improved capacity of IDEAM to establish a weather radar network as part of its real-time observation and now-casting system

This result will be achieved through interactive workshops, study tours, training & support on

- establishing a planning project on the use of weather radar data. This would include Identification of operators, service providers, stakeholders and customers.
- making the staff acquainted with weather radars as a component of the observation system and a tool to support now casting: basic training on weather radars, calibration and maintenance, data retrieval and processing, creating basic products,

composites etc., Identifying customers and customer needs, creating specialized products
- creation of technical weather radar requirement documents (in case of purchase process is activated)

Indicators:

- Improved co-operation between stakeholders, weather radar operators and users
- Improved readiness at IDEAM to use weather radar data
- Balance of men and women attending project activities

Sources of verification:

- Reports and minutes of meetings with stakeholders and weather radar operators
- Development plan on the use of weather radar data at IDEAM
- Project reports

Result 3: Enhanced capacity of IDEAM to provide weather services and early warnings on severe weather phenomena in support of disaster risk management

This result will be achieved through interactive workshops, study tours, training & support on
- Introducing tools for working with online weather data
- developing formulation and communication methods for weather warnings and alerts
- demonstration of a production environment in use at FMI to visualize and overlay different data sources, control and edit of numerical forecast data, develop macros for automated data control, etc.
- developing and maintain customer relations: Identifying customer needs, measuring customer satisfaction, maintaining customer relations, marketing the products and services
- creating data verification procedures for monitoring and improving the quality of the weather forecasts.

Indicators

- New methods and tool adopted on governance working methods and customer relations
- Improved understanding on the development of service products
- Improved user satisfaction on weather services
- Balance of men and women attending project activities

Sources of verification:

- Development plan on provision of weather services.
- Plan on product development
- Survey on customer satisfaction
- Project reports

3.2 Project Activities and Inputs

'Project Activities' consist of workshops and study tours organized around the topics indicated in the Results section. The inputs are the resources used for each activity and explicitly included in the project budget. Preparatory work before and conclusive/ follow-up work after the actual workshops/study tours are included in the resources of each Activity.

Result 1: Improved capacity of IDEAM to manage meteorological station networks, archive observational data and monitor/control data quality

Activity 1.1: Training Workshops on Observation Metadata, Database, QA/QC

- Assistance and training in structuring the metadata online documentation
- Assistance in configuring the database tables and data I/O
- Assistance and training in the development of software for handling metadata
- Assistance in development of visualization tools to display observation data

Inputs:

Work days by FMI 2012	**14**
Work days by FMI 2013	**14**
Missions to Colombia 2012	2
Missions to Colombia 2013	2

Activity 1.2: Support for the development of observation data monitoring, databases, QA/QC process

- Training on methods of data quality assurance and control
- Assistance in development methodology and software to for on-line monitoring of data quality

Inputs:

Work days by FMI 2012	**5**
Work days by FMI 2013	**5**
Missions to Colombia 2012	0
Missions to Colombia 2013	1

Result 2: Improved capacity of IDEAM to establish a weather radar network as part of its real-time observation and now-casting system

Activity 2.1: Creating a planning project on weather radars

- Identifying the members of the project team
- Identification of operators, service providers, stakeholders, customers
- Mapping the factors affecting the use of weather radar products in the country
- Workshops and hands-on training on the creation of technical weather radar requirement documents.

Inputs:

Work days by FMI 2012	14
Work days by FMI 2013	14
Missions to Colombia 2012	2
Missions to Colombia 2013	2

Activity 2.2 Training on radar technology, product development and establishment of radar based now casting services

- Basic training on weather radars
- Calibration and maintenance
- Data retrieval and processing
- Creating basic products, composites, specialized products etc.
- Identifying customers and customer needs

Inputs:

Work days by FMI 2012	20
2013Work days by FMI	16
Missions to Colombia 2012	2
Missions to Colombia 2013	2

Result 3: Enhanced capacity of IDEAM to provide weather services and early warnings on severe weather phenomena in support of disaster risk management

Activity 3.1 Introducing tools for working with online weather data

- Assistance and training in the generation of modern automated weather service products and services using accurate real-time weather observations
- Demonstration of software tools for analysing temporal and spatial data sets
- demonstration using SmartMet (a production environment in use at FMI) to visualize and overlay different data sources, control and edit of Numerical forecast data, develop macros for automated data control

Inputs:

Work days by FMI 2012	16
2013Work days by FMI	15
Missions to Colombia 2012	2
Missions to Colombia 2013	2

Activity 3.2 Benchmarking FMI processes on weather observations, weather radar and customer services.

Study tours, workshops including demonstrations and training on:

- Managing observation networks and data
- Calibration of standard meteorological instruments
- Weather radar applications
- Handling customer relations
- Marketing
- Institutional governance
- Cooperation with agencies and stakeholders

Inputs:

Work days by FMI 2012	21
Work days by FMI 2013	21
Study tours to Finland 2012	1 (for 7 persons)

Activity 3.3 Development of forecast verification systems

- Support for the creation of data verification procedures at IDEAM for monitoring and improving the quality of the weather forecasts.

Inputs:

Work days by FMI 2012	8
Work days by FMI 2013	8
Mission to Colombia 2012	1
Missions to Colombia 2013	1

4. The approach on capacity building

4.1 Capacity building methods

The Project greatly benefits from the successfully on-going ICI project between Peru and Finland. FMI has a good and reliable reputation in Latin America and there is a high degree of confidence between the parties. The IDEAM has estimated the total number of staff participating to the different parts of training as well as to the implementation of the project.

- Study tours at FMI, Finland: 2 (senior staff, Meteorologists, engineers and technicians Key-experts from IDEAM) at FMI
- Training courses, seminars and workshops at IDEAM, Colombia: All together some 10 – 15 workshops
- In addition IDEAM makes available Office Facilities: Office for experts in mission to Colombia and conference rooms and facilities for training and workshops. Any office or laboratory of the sections/units in IDEAM is opened to the experts for any homework or demonstration.

FMI staff will work as instructors, provide training facilities in Finland, arrange travel, transport and accommodation during the training courses in Finland as well as assist in visa arrangements.

The Project will start with a joint Kick-off Workshop in Bogota for project participants and the stakeholders. The workshop will include presentation of the project and its objectives for discussion with the stakeholders. The project results will be adjusted according to the outcome of the discussions. For the involvement of the stakeholders and follow-up of the project joint workshops will be organized once or twice a year.

The basic training method for IDEAM staff in this project is hands-on training, i.e. FMI and IDEAM experts will work closely together to transfer Finnish knowhow and to develop new working methods and processes in utilization of real time observations, from automatic weather stations, weather radars, satellite observations and numerical model output in developing meteorological services and commercial services. The training will be carried out mostly during FMI experts' mission to Colombia. Also IDEAM experts study visits to Finland will be organized.

- Focused visits of FMI experts to IDEAM for hands-on training
- IDEAM experts' study visits to FMI
- A workshop for stakeholders including government agencies and media

The training courses will be planned so that they do not affect too much the regular activities of IDEAM. Part of training will be learning-by-doing and the project will be seen as guidance of IDEAM staff in different working fields.

The expected changes in the of IDEAM will be seen as improved organization of tasks, increased number of modernized products and enhanced communication with the user sector.

As mentioned above, the main method for capacity building is a training program including training courses in Finland and in Colombia. Part of training is in-house training in IDEAM and part study visits to FMI. Training will make use of the FMI Knowledge (http://knowledge.fmi.fi/) virtual learning environment (Moodle). The platform will include training material, exercises and exchange of information between the trainees and trainers. The virtual office is protected by personal passwords.

4.2 Cross-cutting Issues

The Project promotes awareness on environmental issues through improved weather and especially climate services and products. The Project does not include construction or other polluting activities, but aims to improve public awareness and on how to adapt to climate change.

Measurable Indicators:

- Workshop outcomes
- Sustainable and end-user driven public and private weather and climate services

4.2.1 Gender

Currently, women are a minority in the professional categories of IDEAM staff, particularly at senior and management levels. The Project will encourage IDEAM to ensure that they provide equal opportunities to promote the participation of female professional staff in any training programme which will be run as part of the Project. The FMI will also appoint women as key experts for the project to carry out the capacity building activities. All Study Tours and Workshops will have a quota for women and discrimination will not be tolerated.

Measurable Indicators:

- Balance of women and men as key-experts in the project
- Number of women participants in the project activities

4.2.2 Good governance

The successful implementation of the Project will depend upon the existence of an atmosphere which will promote good governance. The Project will promote the strengthening

of good governance in all its activities. For example procurement procedures will be transparent, and will be done according to Finnish State practice and guidelines. During Study-tours to Finland Finnish State travel regulations will be followed. During the study tours to FMI, IDEAM will have the opportunity to learn how activities are handled at FMI according to good governance.

Measurable Indicators:

- Improved co-operation between stakeholders
- Progress of the project is followed and reported regularly by board meetings and by the nominated experts
- Project information will be available on a shared web-page (knowledge.fmi.fi)

4.2.3 Combatting Poverty

Eradication of poverty is at the core of this project. Better and more reliable weather and climate forecast and products will evidently foster different economic sectors of society, for example better harvest prospects and less loss of crops because of weather hazards. The Project contributes towards sustainable economy by helping the IDEAM so that they can:

- support all citizens and vital production sectors in Colombia
  - by enhancing severe weather early warning services
  - by improving capacities of IDEAM to produce reliable forecasts in various time scales
  - by providing information needed for climate change adaptation and mitigation
  - by improving capacities of IDEAM to produce high quality weather services
- better fulfil their obligations in disaster management
- provide support to their societies for better resilience against climate induced risks

Measurable Indicators:

- New methods and tools to monitor observation data and supportive information
- Improved quality of warnings and forecasts
- Improved understanding on customer needs
- Improved understanding on the development of service products
- Improved availability of weather and climate information to the public

5. The proposed activities in relation to the other activities of the partner agency

There are clear synergies between the proposed COFIMET project and other on-going development projects in Colombia and in the region. In practice the proposed COFIMET project activities and results have synergies with the CLIBER and MESOAMERICA development projects. Colombians participating in the CLIBER and MESOAMERICA projects can be invited to participate in the COFIMET workshops to be arranged in Colombia.

This project will also create necessary knowledge and platforms at IDEAM and in Colombia which are of advantage for any other development project in the area of meteorology, hydrology, climate change and preparedness for weather hazards e.g. the hydro-meteorological early warning development project for the Andean region which is under consideration at the Ministry of Foreign Affairs in Finland. Persons from the neighbouring countries and meteorological institutes can also be invited to participate in the project workshops to be arranged in Colombia

The IDEAM participates in a variety of international forums such as the United Nations Framework Convention on Climate Change. It represents Colombia in the World Meteorological Organization (WMO), the Intergovernmental Panel on Climate Change (IPCC), and in the Inter-American Institute on Global Change (IAI) among others.

WMO is a coordinating organization of National Hydro-Meteorological Institutes among its other functions generates guidelines for the routine operation of the observation networks, atmospheric models, weather and climate services. Access to WMO's global telecommunication system also ensures that IDEAM has for its use real-time and global hydro-meteorological data and products 24 hours a day.

IDEAM also participates in numerous international observation and monitoring systems of oceans and of the hydrological cycle, particularly attached to UNESCO programs.

International cooperation has been identified as a strategic opportunity for institutional capacity building. The cooperation projects (INAP, SCN, REDD, PRAA CAN, CLIBER) currently in execution include (topics directly or indirectly) linked to this project are underlined):

- **Ibero-american Weather Program (CLIBER)** funded by Spain State Agency of Meteorology to strengthen the capacities of Hydrological and Meteorological Services to Develop and strengthen IDEAM as a institute, to strengthen the national hydrological database, the ITC and telecommunication systems, improve the meteorological monitoring and forecasting activities, monitoring of the rivers and the hydrological operations, seasonal forecasts and to project consequences of the climate change.
- **MESOAMERICA project** financed by IDB, duration 18 months, start in June 2011; 1,125 Mill. US$. Includes among other things the purchase of weather radars for Centro-American countries and Colombia. The Civil Aviation authority (Aerocivil) has purchased a modern Weather Radar which will be installed at the International airport in Bogotá. Ideam could be able to use data from this radar. Support for the Colombian agenda for adaptation to Climate change (Apoyo a la agenda Colombiana de adaptacion al Cambio

Climatico). The four components are: i) Improvement of the mechanisms for the production, analysis and interchange of information between IDEAM and different sectors, ii) Design of a methodology for the development of a strategy for a sectorial adaptation, iii) Implementation of protocols for the monitoring of water cycles and the carbon in ecosystems in the high mountains, iv) institutional strengthening of IDEAM.

For the rehabilitation and modernization of IDEAM the government of Colombia is in process for purchasing meteorological equipment in order to renew the meteorological infrastructure. The equipment to be purchased is needed in order to complete the existing monitoring networks of IDEAM.

The strategic plan of IDEAM for 2010-2014 include following activities in relation to the objectives of the ICI project:

a) Strengthening of the hydro-meteorological observation network, replacement of IDEAM}s meteorological stations, Increase the number of meteorological stations for the transmission of information for the World Meteorological Monitoring program (Programa de Vigilancia Meteorológica Mundial).

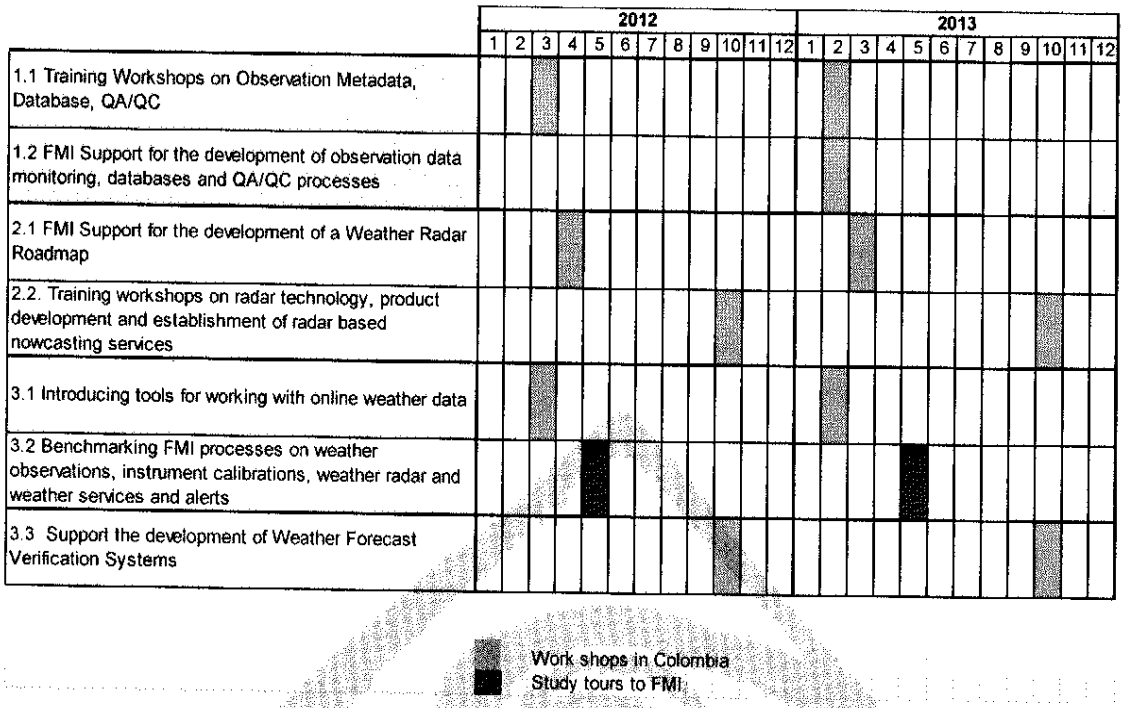
b) Generate, evaluate and validate the regional and global weather and climatological forecasting models incorporating the climate variabilities. Generar, evaluar y validar los modelos globales y regionales de pronóstico del tiempo y predicción del clima incorporando la variabilidad climática.

c) Provide meteorological and climatological services for the different productive sectors (hydrocarbons, mining, real-estate, transport, agriculture) and to consolidate specialized information for each sector.

d) Provide meteorological services for the national and international air traffic.

6. Time Schedule

The project is planned to last 2 years, starting in January 2012. The duration of the project is dictated on one hand by optimal use of FMI human resources in different international projects and normal operation of FMI, and on the other hand by the IDEAM possibilities to allocate human resources for different tasks to fully take part in the proposed activities. A draft schedule of Activities is presented below.



The time schedule is greatly affected by the date of approval for the project initiation and at the moment can only be considered tentative. By nature, some activities are longer on-going development activities whereas some are more intensive workshop-type events.

7. Sustainability and Perceived Risks

7.1 Sustainability

A great deal of attention has been given to address issues that aim for the provision of better services to support the sustainable development of Colombia. The activities planned are in line with the near- and long-term needs of the beneficiaries and the whole society. The planning of the Project is based on the principle that this Project will support the sustainable development of IDEAM, the economy, regional development, and protection of the environment.

The capacity building actions within this project will form a basis for future IDEAM strategies on institute level and department and unit levels. Project will enhance the IDEAM possibilities to provide better weather and climate services in Colombia. The sustainability of the project results will be guaranteed by close co-operation, learning-by-doing guidance and deep involvement from both sides so that the new skills will be taken into use during the project.

The project will also improve the sustainability of the IDEAM investment into infrastructure by improving maintenance and calibration processes and by creating cost recovery and commercial services at the IDEAM. In the event where infrastructure investments are

postponed, this project is viable and will support the on-going modernization and development of IDEAM operations.

7.2 Perceived Risks

If possible infrastructure investments are postponed the outcome of this project will slightly be altered. The improvement of the meteorological infrastructure is required at IDEAM for the improvement of services, but this project can address institutional capacity development independently. The most significant effect on outcomes would be the missed win-win opportunities that the two projects would offer for IDEAM. All project activities can be carried out although weather radar infrastructure investment project postponed with a year or two.

A state of peace in the country is the prerequisite for sustainable development, and political tensions in the country provide the greatest risk for this project. It currently seems that the situation is no longer volatile and therefore the project is not expected to have major difficulties. In terms of the IDEAM, there have not been any issues indicating this. The Project contains elements that address whole Colombia and these can be altered if the situation so requires by e.g. shifting the focus more towards either part or region of the country.

Key Assumptions for the project implementation are:

- Needs of IDEAM have been recognized by the Colombian government and required investments on resources have been executed
- IDEAM has access to weather radar data from the Civil Aviation authority in Colombia
- Working relations between IDEAM and the National Disaster Management Office established
- Observation station metadata information available
- End user needs evaluated and prioritised by IDEAM
- Key IDEAM staff available for travel

8. Project organization

The Project will be managed jointly by IDEAM and FMI. The owner of the project is IDEAM. The responsibilities of the project parties are detailed in the Project Memorandum of Understanding (MoU). Project manager and assistant project manager also have expert positions within the project.

The stakeholders of the project are

Internal Stakeholders

- Ministry of Environment and Sustainable Development (MADS)
- Consulting Services Unit of the FMI
- Ministry for Foreign Affairs of Finland

External Stakeholders

- Civil defense (Defensa Civil Colombiana)
- Hydro-management
- Civil Aviation Authority (Aerocivil)
- General Risk Management of Colombia (Dirección General de Riesgos)

The project will start with a kick-off workshop where the representatives of the stakeholders will be invited.

8.1 Named project members from FMI

FMI:

Mr. Mats Wiljander.

- Project Manager
- Mr. Mats Wiljander is an experienced project manager with years of international experience in expert services and meteorological capacity building projects. In this project Mr. Wiljander will provide services in relation to observation networks.

Dr. Martti Heikinheimo

- Assistant Project Manager
- Dr. Heikinheimo is a senior development expert with tens of years of experience from the management of a weather service. Dr. Heikinheimo will provide expertise in warning and weather services development.

Key Experts for Result 1:

Mr. Pauli Rissanen

- Mr. Rissanen is senior expert in observation networks and will provide expertise in the planning and management of observation networks AWS, data handling, Data quality assurance and quality control.

Mr. Mats Wiljander.

- In this project Mr. Wiljander will provide services in relation to observation quality.

Key Experts for Result 2:

Dr. Asko Huuskonen

- Dr. Huuskonen is an expert on weather radars and will provide expertise on weather radars

Dr. Elena Saltikoff

- Dr. Saltikoff is an expert on weather radars and will provide expertise on weather radars

Mr. Alessandro Chiariello

- Mr. Chiariello is a Training Support Officer for the European "Eumetcal" programme and provides expertise in weather radars

Key Experts for Result 3:

Mr Juha Kilpinen

- Mr. Kilpinen is a senior system expert and researcher at the FMI and has been extensively involved in international development and research projects. Mr. Kilpinen will provide expertise in NWP, verification and data management Weather production System Expert

Dr. Pertti Nurmi

- Dr. Nurmi is a senior manager of authority services and warnings and will provide expertise in verification systems
  Database and Data Management Expert

Mr Mikko Rauhala

- Mr. Rauhala is an experienced international project expert and senior system specialist who is in charge of the weather production process from the ICT side. He will provide expertise in generation of automatic products. DRM and Authority Services Expert

Ms. Jenni Rauhala

- Met. Jenni Rauhala is a senior meteorologist with experience in forecasting warnings and will provide expertise in forecasting systems.

Dr. Martti Heikinheimo

- Dr. Heikinheimo will provide expertise in warning and weather services development

Mr. Jussi Haapalainen

- Mr. Haapalainen is a AWS maintenance and installation expert and will provide expertise regarding instrument maintenance and calibration

8.2 Named project members from IDEAM

IDEAM Project Managers

- **Mr. Ernesto Rangel**
  - *Sub-director, head of the meteorological department*
  - Coordination and management of the project at IDEAM
  - Annual Working Plans in cooperation with the FMI Project Manager
  - Reporting

- **Ms. Maria Teresa Martinez G**
  - *Head of the forecasting and alert office*
  - Coordination and management of the project at IDEAM
  - Annual Working Plans in cooperation with the FMI Project Manager
  - Reporting

Key Expert 1 for Result 1:

- **Mr. Ernesto Rangel**
  - *Sub-director, head of the meteorological department*
  - Coordination and management of the component 1 at IDEAM
  - Reporting

Key Expert 2 for Result 1

- **Mr. Jorge Gonzalez**
  - *Coordinator of the operation & planning of the observation network*
  - Member of the team, component 1 at IDEAM
  - Reporting

Key Expert 3 for Result 1
- **Mr. Hugo Saavedra**
  - *Expert on climate studies, variability and climate prediction*
  - Member of the team , component 1 at IDEAM
  - Reporting
  -

Key Expert 1 for Result 2
- **Mr. Leonardo Fajardo Sierra**
- *Expert on Electronic Engineering*
- Member of the team of the component 2 at IDEAM
- Reporting

Key Expert 2 for Result 2
- **Dr. Alejandro Uribe C.**
- Expert on Meteorology and *weather forecasting.*
- Coordination of the component 2 at IDEAM
- Reporting

Key Expert 1 for Result 3

Mr. Fidel Alberto Pardo Ojeda
- Expert on Hydrology and *weather forecasting.*
- Coordinator of the component 3 at IDEAM
- Reporting

Key Expert 2 for Result 3
- **Mr. José Franklyn Ruiz Murcia**
  - *Expert on weather forecasting, use of numerical models*
  - Member of the project team, component 3 at IDEAM
  - Reporting

Key Expert 3 for Result 3
- **Ms. Yolanda Gonzalez Hernandez**
  - *Expert in weather forecasting*
  - Member of the project team, component 3 at IDEAM

The Project Manager reports to the Project Board in all matters regarding the management of the Project.

8.3 Project Board

Finland:	Dr Petteri Taalas, Director General, FMI
	Mr Harri Pietarila, Head of Consulting Services, FMI
Colombia:	Mr Ricardo Lozano Picón, Director General, IDEAM
	or delegate

The Project Board has the authority over the project budget and it is responsible for

- Approval of the project progress reports
- Decide on the possible changes in the Project
- Approve annual working plans and budgets
- Receive feedback from the beneficiaries

9. Budget

The IDEAM contribution to the project will be in-kind in the form of staff resources for the development activities. IDEAM will provide roughly 6 man-months of its staff resources for the project. The similar nature of the ICI projects for IDEAM, Colombia and INAHMI, Ecuador provides a good opportunity for synergies as expert missions and workshops between the countries can be combined and thus project costs reduced.

9.1. Total Project Budget

TOTAL PROJECT BUDGET				
	days	average costs per day	total costs	% of total
A Capacity building costs				
A1. Assignment fees, FMI experts				
work in Finland	30	648,9 €	19 467,7 €	
work in region	161	648,9 €	104 476,6 €	
A1. Subtotal	**191**		**123 944,3 €**	**49,6**
	units	costs per unit		
A4. Travel Allowances for FMI Experts	139	58,0 €	8 062,0 €	
A7. Travel Allowances for IDEAM Experts	182	32,0 €	5 824,0 €	
Allowances Subtotal	**321**		**13 886,0 €**	**5,6**
A2. FMI Travel Costs	19	1 700,0 €	32 300,0 €	
A5. IDEAM Travel Costs	14	1 840,0 €	25 760,0 €	
Travel Costs Subtotal	**33**		**58 060,0 €**	**23,2**
A3. FMI Accommodation Colombia	105	100,0 €	10 500,0 €	
A6. IDEAM Accommodation Finland	168	120,0 €	20 160,0 €	
Accommodation Subtotal	**273**		**30 660,0 €**	**12,3**
A8. Work assignments subcontracted to region (max 10% of total)			0,0 €	**0,0**
Subtotal A. (at least 70% of total costs)			**226 550,3 €**	**90,6**
B. Administrative technical costs in partner country			**11 300,0 €**	**4,5**
C. Fixed Assets			**0,0 €**	**0,0**
D. Contingency costs (5 - 10%)			**12 100,0 €**	**4,8**
Total (excl. VAT*)			249 950,3 €	

9.2. Annual Budget

Budget lines	Total costs in 2011	Total costs in 2012	Total costs in 2013	Total costs	%
Costs of the Finnish agency					
A.1 Assignment fees	0,00 €	63 465,23 €	60 479,10 €	123 944,33 €	50 %
A.2 Travel costs	0,00 €	15 300,00 €	17 000,00 €	32 300,00 €	13 %
A.3 Accommodation	0,00 €	5 100,00 €	5 400,00 €	10 500,00 €	4 %
A.4 Travel allowances	0,00 €	3 828,00 €	4 234,00 €	8 062,00 €	3 %
Costs of the Partner country agency					
A.5 Travel costs	0,00 €	12 880,00 €	12 880,00 €	25 760,00 €	10 %
A.6 Accommodation	0,00 €	10 080,00 €	10 080,00 €	20 160,00 €	8 %
A.7 Allowances	0,00 €	2 912,00 €	2 912,00 €	5 824,00 €	2 %
Other					
A8. Subcontracted work	0,00 €	0,00 €	0,00 €	0,00 €	
Sub-total A	**0,00 €**	**113 565,23 €**	**112 985,10 €**	**226 550,33 €**	91 %
B. Administrative costs in partner country	**0,00 €**	**5 650,00 €**	**5 650,00 €**	**11 300,00 €**	5 %
C. Fixed assets	**0,00 €**	**0,00 €**	**0,00 €**	**0,00 €**	0 %
D. Contingency costs	**0,00 €**	**6 050,00 €**	**6 050,00 €**	**12 100,00 €**	5 %
Total costs (Euros)	**0,00 €**	**125 265,23 €**	**124 685,10 €**	**249 950,33 €**	
Sub-total A5 - A7 + B + C	0,00 €	31 522,00 €	31 522,00 €	63 044,00 €	25 %

Result areas	Total costs in 2011	Total costs in 2012	Total costs in 2013	Total costs
Result 1	0,00 €	20 350,87 €	23 114,87 €	**43 465,73 €**
Result 2	0,00 €	34 641,31 €	32 309,12 €	**66 950,43 €**
Result 3	0,00 €	70 273,05 €	69 261,12 €	**139 534,17 €**
Total costs	**0,00 €**	**125 265,23 €**	**124 685,10 €**	**249 950,33 €**

9.3. Budget per Activity

Activity	Cost
1.1 Training Workshops on Observation Metadata, Database, QA/QC	31 702,99 €
1.2 FMI Support for the development of observation data monitoring, databases and QA/QC processes	11 762,74 €
2.1 FMI Support for the development of a Weather Radar Roadmap	33 336,68 €
2.2. Training workshops on radar technology, product development and establishment of radar based nowcasting services	33 613,75 €
3.1 Introducing tools for working with online weather data	38 063,53 €
3.2 Benchmarking FMI processes on weather observations, instrument calibrations, weather radar and weather services and alerts	81 570,06 €
3.3 Support the development of Weather Forecast Verification Systems	19 900,58 €
	249 950,33 €

10. Project partner in Colombia

10.1 IDEAM

Mission and tasks of IDEAM

The Hydrological, Meteorological and Environmental Studies Institute (IDEAM[6])), founded in 1993-1995, is a public establishment within the Ministry of Environment Sustainable Development (MADS[7]) giving technical and scientific support to various government agencies and the sectors of the lively hoods. T

The key mission of IDEAM is to act as the technical and scientific excellence of the Colombian Environment Information System (SIAC[8]) for decision making on the sustainable use of natural resources and an authority in the field of environmental data generation and collection, forecasts and warnings'. Accordingly, the mission of IDEAM is to generate information and knowledge to advise the government on sustainable use of natural resources, as well as to make public forecasts and alerts about events that may generate hydro-meteorological disasters.

The main product of IDEAM is strategic information continuously provided and incorporated as an added value on the gross domestic product of the country and its assimilation by the productive sector and society. Examples of sectors of the society benefiting of these services and support include developers environmental policy, and users of biophysical natural resources of the country, agencies mitigating the risk form natural hazards, and the general public.

The main tasks towards this mission are:

a) **Generation, collection and analysis of hydro-meteorological and environmental data;**
   - Provide knowledge, data and environmental information through the National Environmental System (SIAC) for the need of the lively hoods and as required by the Ministry of Environment and other government agencies and. SIAC comprises observation and information systems, databases as well as simulation models on environment, natural resources and hydro-meteorology.
   - Obtain, store, analyze, study, process and disseminate basic information on hydrology, hydrogeology, meteorology, basic biophysical geography, geomorphology, soils and vegetation for the management and use of biophysical resources of the Nation.

b) **Provision of information in a structured manner so that it can be used by SIAC[9], government bodies, different sectors of production, research centers, etc.**

[6] Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia (IDEAM)
[7] Ministerio de Ambiente y Desarollo Sostenible. (MADS)
[8] Sistema de Información Ambiental de Colombia (SIAC)

[9] **Sistema de Información Ambiental de Colombia, SIAC**

- Direct and coordinate the Environmental Information System and operated in collaboration with scientific institutions linked to the Ministry of Environment, corporations and other entities of SIAC.
- To establish the technical basis for classifying and zoning land use for the purposes of national planning and environmental zoning.
- Perform the generation and handling of scientific and technical information on ecosystems that are part of the country's environmental heritage.

c) Generation of knowledge on the behavior of environmental variables

- Follow up of biophysical resources of the nation, especially in relation to contamination and degradation for decision making by environmental authorities.
- Conduct studies and research on natural resources, particularly related to forestry and soil conservation.
- Conduct studies and research on hydrology, meteorology, climate variability and climate change.

d) Generation of knowledge on the society–nature relationship;

- Perform environmental research and studies that reveal the effects of socioeconomic development on the nature, processes, environment and renewable natural resources and environmental indicators suggest.
- Analyze and disseminate data to generate knowledge needed to track the interaction between social, economic, natural factors. Propose alternative technologies, systems and models in support of sustainable development.

e) Generation of knowledge on forecasts and warnings/alerts on natural extreme events that may cause casualties or have economic impact on the normal activities of the Colombian population and the productive sectors.

- Establish and operate the infrastructure to provide meteorological, climatological and oceanographical services, such as past, prevailing and future conditions of weather and climate, the state of seas, as well as to provide warnings and advisory services on extreme natural phenomena and adverse conditions to the community.
- Provide information service in the areas of their competence to users who require it.

Services generated by these functions are seen to ensure the operation, dynamics and competitiveness of the national production and is a fundamental base for ensuring social welfare. Information produced by IDEAM is seen as an essential public good for the nation.

ORGANIGRAMA